DOCUMENT RESUME

ED 098 225 95 SP 008 586

AUTHOR	Hess, Robert D.; Takanishi, Ruby
TITLE	The Relationship of Teacher Behavior and School Characteristics to Student Engagement. Technical Report No. 42.
INSTITUTION	Stanford Univ., Calif. Stanford Center for Research and Development in Teaching.
SPONS AGENCY	National Inst. of Education (DHEW), Washington, D.C.
PUB DATE	Nov 74
CONTRACT	NE-C-00-3-0063
NOTE	139p.; For related document, see ED 087 768
EDRS PRICE	MF-$0.75 HC-$6.60 PLUS POSTAGE
DESCRIPTORS	Class Organization; *Elementary Schools; *Open Plan Schools; Student Characteristics; *Student Participation; Teacher Attitudes; *Teacher Behavior; Teaching Techniques; *Traditional Schools

ABSTRACT

This two-phase study identifies the techniques used by teachers in their classrooms to arouse and maintain the attention and interest of their students (student engagement). During the first phase (reported in another document), 24 third- and fourth-grade teachers and their students in nine elementary schools in low-income communities were the subjects of an investigation examining the principal influences on student engagement including: (a) student characteristics; (b) contextual variables; (c) teacher attitudes toward open space, classroom organization, and control ideology; (d) global teacher strategies; and (e) specific teacher strategies. During the second phase, 15 teachers were observed in a single school, including grades K-6, that moved from self-contained classrooms to a new open-space building. Eight observations were made in each architectural condition. Major findings are that; (a) teacher behavior accounts for a large proportion of variance in student engagement; (b) specific and global teacher strategies are strongly related to level of engagement; (c) teacher attitudes are associated with level of engagement; (d) classroom architecture is not strongly related to level of engagement but is associated with the pattern of classroom organization and teacher-student interaction; (e) student characteristics have little or no correlation with engagement levels; (f) the pattern of classroom organization affects engagement and interacts with classroom architecture in its effects on student behavior; and (g) there is extreme variability in student and teacher behavior in the classroom. (Author)

ED 098225

STANFORD CENTER
FOR RESEARCH AND DEVELOPMENT
IN TEACHING

Technical Report No. 42

THE RELATIONSHIP OF TEACHER BEHAVIOR AND SCHOOL CHARACTERISTICS TO STUDENT ENGAGEMENT

Robert D. Hess and Ruby Takanishi

School of Education
Stanford University
Stanford, California

November 1974

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Published by the Stanford Center for Research and Development in Teaching, supported in part as a research and development center by funds from the National Institute of Education, U. S. Department of Health, Education, and Welfare. The opinions expressed in this publication do not necessarily reflect the position, policy, or endorsement of the National Institute of Education. (Contract No. NE-C-00-3-0063.)

SP 008 586

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The Center's mission is to improve teaching in American schools. Its work is carried out through five programs:

- Teaching Effectiveness
- The Environment for Teaching
- Teaching Students from Low-Income Areas
- Teaching and Linguistic Pluralism
- Exploratory and Related Studies

This report presents part of the work of the program on Teaching Students from Low-Income Areas.

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Acknowledgments

Our thanks to the people who assisted with the study, especially the teachers, students, principals, and others with whom we worked at the schools. Within the Center, we would especially like to thank the Methodology Unit, Silvia Solotar and Penney Jordan, and the Audio Visual Unit, Bill Smeltzer, Roger Williams, and Richard Brody. Several faculty colleagues, particularly Lee Cronbach, Janet Elashoff, Ingram Olkin, and Rosedith Sitgreaves, gave us comments about problems of data analysis.

A number of research assistants contributed to the project in various ways. Special thanks to Ann Bouie, Terre Delgado, Betty Dietz, Mark Everson, Jennifer Greene, Kirby Heller, Kalei Inn, Gerry Mercadante, Anne Morton, Shari Otto, Ann Porteus, Diane Schaffer, Connie Sutherland, Terry Taylor, Mary Lee Thomson, Noreen Webb, and Lucy Williams.

The classroom observers deserve appreciation for their part in the project: Marsha Alper, Robert Bates, Paul Chesler, Deborah Durham, Peter Gregerson, Mary McLean, Nancy Morris, Carol Nash, Libby Rossiter, Polly Snyder, and Mark Steinberg. For administrative support and technical assistance we owe much to Rita Duncan, Joan Huff Minor, Fran O'Connell, Janet Weston, and Debbie Younggren.

The editorial work on the final draft was supervised and carried out by Louise Manning, who joined us late in the project but at a critical time.

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List of Abbreviations

The following abbreviations are used in tables and figures in this report:

Adm./Man.	Administers/Manages
A.Suc.	Anticipates Success
Chall.	Challenges
Chg.Act.	Changes Activity
Choice	Provides Choice
Comds.	Commands
Con.Pers.	Constrains by Personalizing
Con.Tch.	Constrains by Touching
Displ.	Disciplines
E.Man.M.	Encourages Manipulation of Materials
F.Comp.	Fosters Competition
G.Con.Fdbk.	Gives Constraining Feedback
G.Fdbk.	Gives Feedback
MP	Material/Peer-Directed
OS	Open Space
Pers.	Personalizes
P.Task	Personalizes Task
Quest.	Questions
R.I.A.	Recognizes Individual Achievement
SC	Self-contained
Sts./Exp.	States/Explains
Sums.	Summarizes
Surp.	Surprises
TD	Teacher-Directed
U.Vis.A.	Uses Visual Aids

CHAPTER 1: BACKGROUND, OBJECTIVES, AND RESEARCH APPROACH

The Problem and Objectives

Even with a sophisticated curriculum and well-designed instructional materials, teaching can be effective only if the features of the learning situation engage the attention and energy of the student. The role of attention--which we call engagement--as a mediating process in the teaching-learning transaction has received relatively little research effort, perhaps because it is assumed that "good" teachers and "good" curricula naturally stimulate students. The elements of a teaching context and of teaching techniques or strategies that act to arouse interest and maintain attention, however, are separable from other features of the teaching process. It is this part of the total teaching activity that was the focus of this study.

Whatever "natural curiosity" is, it does not occur in a vacuum. Student involvement in classroom activities can be enhanced or diminished. Engagement can be reduced by a number of factors: disparity between the student's personal experience and the material presented by the teacher (as may happen with children from low-income homes or from cultures having little in common with the teacher's own background); previous aversive classroom experiences of the student which "turn him off" to school; ineptness of the teacher in relating interpersonally to the class; fatigue, peer pressure; and numerous other distractions. In effect, the teacher is competing with other attractions and pressures for the student's energy. Even in an ideal match of interest and background between teacher and student, the learning situation must have elements that attract the attention of the learner if teaching is to occur.

Stimulating and maintaining the attention of students is thus of interest to teachers in all classrooms and particularly so where attempts

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are being made to improve the quality of education offered to the community. If, as we assume, creating student interest will promote learning, then techniques for making the learning situation more attractive and exciting to the student will contribute to student achievement. In schools where student achievement has been relatively low, the use of such techniques and strategies may be especially important as part of the total effort to improve the educational environment.

In low-income and minority communities especially, schools have often failed to offer relevant and stimulating educational experiences that make sense to children and to which they can relate. Yet it is particularly critical that the classroom activities engage the students' interest. Some have not reached the level of accomplishment in basic academic skills, such as reading, that enables them to use the materials typical for their grade levels. Children with unsuccessful school learning experiences, who have in boredom and frustration turned off to the school, challenge the resourcefulness of the teacher if they are to be convinced that school is a place in which it is worthwhile to invest their interest and energy. In attempts to develop more successful efforts to improve educational opportunity and achievement, the ability of the teacher to create, select, and use strategies that more effectively engage the students may be a critical factor.

In the rapid growth of new programs for minority and low-income students during the last decade, there have been many research and developmental efforts to facilitate achievement by creating new instructional techniques or curricular formats and materials. The success of these new materials, curricula, and technology depends, in our view, on establishing classroom conditions in which they can be used. The availability of new materials and innovative methods is obviously not sufficient in itself. Attention should also be given to the social and affective context in which learning is supposed to take place. No curriculum can be effective with students disenchanted by negative school experiences.

This study was thus focused on one of the mediating processes--engagement--that affect the quality of teaching and learning in classrooms. Of special interest were the strategies that teachers use in low-income-area schools to engage their students and the relative extent to which these strategies are successful.

Underlying the study was an assumption that the teacher has the responsibility for establishing an effective educational environment. This assumption contrasts with the view that it is the duty of the student to attend to the teacher. We view the student as the educational consumer, selecting instruction or materials that are appealing and ignoring those that are not. The format of mass-media educational programs, such as "Sesame Street" and "The Electric Company," illustrate this approach. Motivation and interest are seen as a partial result of the program design rather than as exclusive properties of the student.

The overall approach of the study, as initially formulated, was to identify through observation the techniques and strategies that teachers in actual classrooms used to engage their students. In short, our goal was to discover what teachers did to "turn on" their students. In general terms, the objectives of the study were (a) to identify teacher strategies for engaging students, (b) to determine levels of student engagement, and (c) to examine the relationship between teacher behavior and student engagement.

Theoretical and Empirical Framework

Although a large body of prescriptive literature about teaching exists, teacher engagement strategies have not received much research attention (Maehr and Sjogen, 1971; Rosenshine, 1971). The prescriptive literature offers "how to teach" strategies based on generalizations from laboratory research, educational philosophy, theoretical orientations, and common sense, but these suggested strategies are rarely based on research on teacher and student behavior in actual classrooms. With the exception of achievement motivation, little theory and research have focused on motivation in classroom settings (Weiner, 1969). The work of de Charms (1971), Di Vesta et al. (1971), and researchers at the Wisconsin Research and Development Center for Cognitive Learning (Sorenson et al., 1970) are some of the few attempts to relate motivational theory and research to classroom teaching.

A review of theory and research on human learning, motivation, and teaching provided an empirical base for deriving teacher engagement strategies for this study. In addition, we interviewed a number of teachers about their strategies for engaging students and then drew implications about teacher behavior that might be related to student engagement. From this work, observable teacher behaviors were specified and became the basis of a Teacher Strategy Instrument.

Logically, initial student attention to the task is essential for learning. Theory and research on novelty and curiosity motivation suggest that the teacher can manipulate properties of the environment to arouse and focus student attention. Berlyne (1963) argues that situations characterized by novelty (change, surprise), complexity (amount of variety or diversity in a stimulus pattern), and uncertainty have attention-arousing properties. These situations are hypothesized to lead to a motivational state of epistemic curiosity by the creation of a discrepancy between experience (informational input) and expectation (prior learning). Epistemic curiosity refers to an inner state of high arousal that can be relieved by specific exploratory activities. Berlyne's curiosity theory is similar to cognitive consistency theory, which can be stated in terms of congruity and incongruity (Osgood and Tannenbaum, 1955), balance and imbalance (Abelson and Rosenbaum, 1958; Heider, 1946), or consonance and dissonance (Festinger, 1964). Schultz (1970) has discussed in detail elements involved in the arousal of the learner based on the creation of a discrepancy between experience and expectation.

The empirical work on curiosity and arousal suggests that there are three primary characteristics of stimuli that might have application to the design of instructional settings in which arousal and engagement are desired: stimulus variability, novelty and surprise, and incongruity. To a degree, these have been deliberately incorporated in more or less systematic ways into educational writings and practice.

Research by Coats and Smidchens (1966) suggests that variability of teacher behavior can have strong motivational effects on students. Teachers can introduce stimulus variability by using different kinds of instructional devices and materials, by changing activities within the lesson, or by changing the instructional groupings of the students.

Teachers can present stimuli that are essentially "new" (novelty), or are sudden or abrupt in appe~~aranc~~e (surprise). Distributing sealed envelopes, each containing a different number of straws, to a class and asking pairs of students to open their envelopes, count the straws, and perform all possible arithmetic operations on the two numbers, is an instance of the use of novelty to enhance skill practice.

Incongruity is a condition in which the input is composed of stimulus elements not previously associated. For example, a teacher starts work on number bases by writing "2 + 2 = 2" on the board and asking the class "How can that be?"

These instructional applications are based on a substantial body of research indicating that discrepancy leads to the learner's arousal and that experience and expectations contribute to arousal. The reasons why discrepancies arouse the learner, however, are still a subject of disagreement (Berlyne, 1965; Mandler, 1964).

Once student engagement is aroused, it must be maintained in order to continue the learning process. If the creation of epistemic curiosity leads to sustained student involvement in learning, the discrepancy has led to a productive outcome. Habituation to discrepancy effects, however, with an accompanying loss of interest also occurs when the stimuli are constantly repeated (Davis, Buchwald, and Frankmann, 1955; Sharpless and Jaspar, 1956).

There are two implications of the habituation effect for teacher engagement strategies. First, a teacher cannot display the same behavior or patterns over an extended period of time and expect continued high student engagement. For example, if a teacher continually reinforces a child, this repetition may minimize the motivational power of reinforcement; in the Coats and Smidchens study (1966), students became habituated to a "dynamic" lecturer. The second implication is that the teacher should be modifying continually the discrepancies presented to students. Bruner (1966) has referred to this process as the pacing or sequencing of optimal levels of uncertainty. In his discussion of the problem of the "match," Hunt (1965) notes that if the mismatch (discrepancy) is too great, the learner may become anxious or withdraw from the situation or both; likewise, if the mismatch is too small, the learner will either not attend to the stimuli or become bored. Thus, Hunt considers the problem of the match as highly important in teaching strategies. The teacher's task is to find the circumstances or conditions that will continue to interest the student in learning. This task involves sensitivity to the student's background, needs, abilities, learning sets, and interests in order to predict which cues or arrangements of cues will be most interesting, as well as when they may be most interesting.

A specific means by which a teacher can reduce an initially large discrepancy for the student is by the use of "advanced organizers" (Ausubel, 1968) or learning sets (Harlow, 1949). Both means serve to direct the learner's attention to certain features of the stimulus complex and to provide him with some structure for incorporating new experiences. Teachers can create learning sets or organizers by pointing out the goals of the task and by structuring the lesson to indicate how the task is similar to some previous or more general learning task or experience.

A challenge of mastery or competition may also maintain student interest. The desire to assert or reaffirm competence or to show oneself more competent than others (as in spelling contests, for example, or in challenges to get a task done faster and better than previously) seem to have particular motivational force. These strategies present the student with a task neither too easy nor clearly beyond his capabilities. This type of match between his known competence and the challenge has considerable motivating power. It is, perhaps, an example of White's (1959) concept of effectance motivation, which "aims for the feeling of efficacy, not for vitally important learnings which come as its consequences."

A teacher may also maintain engagement by challenging the learner with inconsistencies in his answers or by presenting him with new or contradictory evidence. This process tends to create a new discrepancy once the previous one has been resolved. In this way, teachers may be cognitive models of engagement--modeling inquiry and exploration, asking challenging questions, and testing hypotheses. Rashid (1968) notes that the degree of skill with which teachers themselves deal with subject matter and the clarity with which they communicate this skill to children may be the basis for strong cognitive modeling in classroom situations.

Finally, informational feedback on the correctness or appropriateness of behavior is also a means of directing attention to correct responses and of increasing the probability of their reoccurring. Thus teachers can use reinforcement as a means of creating the feeling of competence in the student. Reinforcement can be provided verbally, e.g., "Good!" or "You're doing a great job!," as well as nonverbally, e.g., smiling or affectionately touching a child. Teachers can personalize reinforcements according to their judgments of student needs and characteristics (Lesser, 1971). They can reinforce student initiative, curiosity, and exploration, as well as provide corrective feedback.

The data gathered in classroom settings in this study were to provide a basis for testing these generalizations about teacher engagement strategies. The network of influences on student engagement is extraordinarily complex in the natural habitat of the classroom. Our results led us to try to develop a conception of the engagement process and the teacher's role in it which recognized this complexity. The modification of our approach is discussed below.

Methods and Findings of the First Phase of the Project

The project staff has completed two phases of data gathering in natural classrooms. The first of these was conducted during the 1971-72 school year; the second during the 1972-73 year. The material for this technical report is taken primarily from the 1972-73 data. Methods and results of the initial phase were reported in detail earlier (Hess et al., 1973) and will only be summarized here to provide a context for the second year of the field study and to indicate the changes incorporated in the design and procedures.

In the first year, the central goal of the study was to identify effective teacher strategies associated with student engagement in actual classrooms. Student engagement was defined as observable interest in and/or attention to a learning task prescribed by the teacher.

Observations for the first phase were made in 24 third- and fourth-grade classrooms in nine low-income-area schools in the San Francisco Bay area of California from September 1971 through May 1972. Classroom observers for the project received intensive training in August 1971 and again in February 1972. Interobserver agreement averaged around 90 percent for most categories on the instruments used.

Two observers worked as a team; one recorded the teacher's behavior on the Teacher Strategy Instrument while the other recorded student behavior on the Student Engagement Instrument, following in sequence a preselected sample of ten students.[1] Procedures were coordinated so that observations of both teacher and students were made in simultaneous ten-second intervals (with a ten-second period for recording); one interval thus contained data on ten seconds of teacher strategy use and ten seconds of engagement rating and other information (e.g., sex, ethnicity, size of instructional group) on one child. Each classroom was observed eight times, twice on four different days during the school year. Each observation time was approximately 30 minutes of instruction (90 intervals) in academic subject matter. The data set contained 16,086 observation intervals of student data and 16,687 intervals of teacher data.

Data were gathered in the sample classrooms on engagement and strategy use; analysis was done separately in these two areas, and attempts were then made to link strategy use to student engagement levels.

The level of engagement was determined by the percentage of the total number of observation intervals in which the observed students were rated engaged (either receptive or expressive mode). Levels of engagement for each classroom and observation time are shown in Table 1.1. Striking intra- and inter-classroom variations are evident in these data. No differences attributable to either student sex or ethnicity were found. Subject matter effects were tested and also showed no significant differences.

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[1] The category definitions and instruments of the first phase are comparable to those for 1972-73, which are presented in Chapter 2 and Appendix A.

TABLE 1.1

Engagement Levels by Classroom across Observation Times, 1971-72
(Percentages)

Classroom Code	Observation Time							
	1	2	3	4	5	6	7	8
1	63	79	76	100	92	93	91	88
2	86	64	83	76	90	98	90	81
3	64	79	83	99	83	87	83	90
4	83	69	81	87	78	98	69	82
5	74	88	72	75	83	68	79	73
6	38	73	63	63	72	63	89	82
7	67	88	81	80	80	81	94	94
8	86	82	50	69	70	48	70	93
9	77	80	93	73	87	78	99	72
10	78	97	86	74	84	89	80	92
11	87	81	92	80	85	78	84	89
12	84	81	96	55	79	87	81	79
13	78	88	79	80	75	88	96	90
14	94	87	95	78	74	94	73	94
15	75	63	79	63	89	74	91	73
16	92	81	85	79	73	83	86	99
17	77	76	67	79	87	68	82	60
18	94	64	94	63	78	92	93	69
19	68	67	74	90	88	86	86	88
20	65	44	94	76	77	93	81	69
21	70	69	99	73	83	94	81	61
22	68	88	71	83	97	81	84	86
23	49	49	82	76	63	76	81	85
24	69	77	87	82	84	73	86	86
Mean	74	75	82	77	81	83	85	82
Range	38-94	44-97	50-99	55-100	63-97	48-98	69-99	60-99

Significant differences were found, however, between levels of engagement in large groups (nine or more students) and those in dyadic (one-to-one) or small groups (two to eight students). The results suggested that as the number of students in the instructional group increased, the percentage of students engaged tended to decrease (Hess et al., 1973; Takanishi-Knowles, 1973).

The sample schools differed from one another in average levels of engagement. Figure 1.1 shows the means and ranges of engagement levels in the six schools. The origins of school-to-school differences are not examined in this study. They do raise the possibility that characteristics of a total school and neighborhood could affect levels of engagement in ways not discernible through studies of teachers and classrooms.

We defined teacher strategies as overt and observable bits of behavior, such as asking a specific question, smiling, or giving feedback to a student (see Teacher Strategy Instrument in Appendix A). Examination of frequency and consistency of strategy use both among and within teachers showed that some strategies or techniques were used with relatively great frequency across all teachers while others were used relatively infrequently. As with the engagement data, variation was a striking aspect of teacher strategy use.

An analysis of a priori groupings of strategies (strategy classes) showed that teachers used more affective strategies with students in dyadic and small instructional groups than they did with students in large groups and that stimulus variation and change strategies were used more with students in large instructional groups (Hess et al., 1973; Takanishi-Knowles, 1973).

Four methods were used to examine possible links between teacher strategy use and student engagement levels: (a) a comparison of patterns of strategies used by teachers whose classes showed high average levels of engagement and those whose classes showed lower levels; (b) a comparison of types of engagement (receptive versus expressive) associated with each strategy; (c) an examination of the tendency of teachers to teach in relatively small groups (a global strategy) as an explanation of inter-teacher differences in levels of engagement; and (d) computation

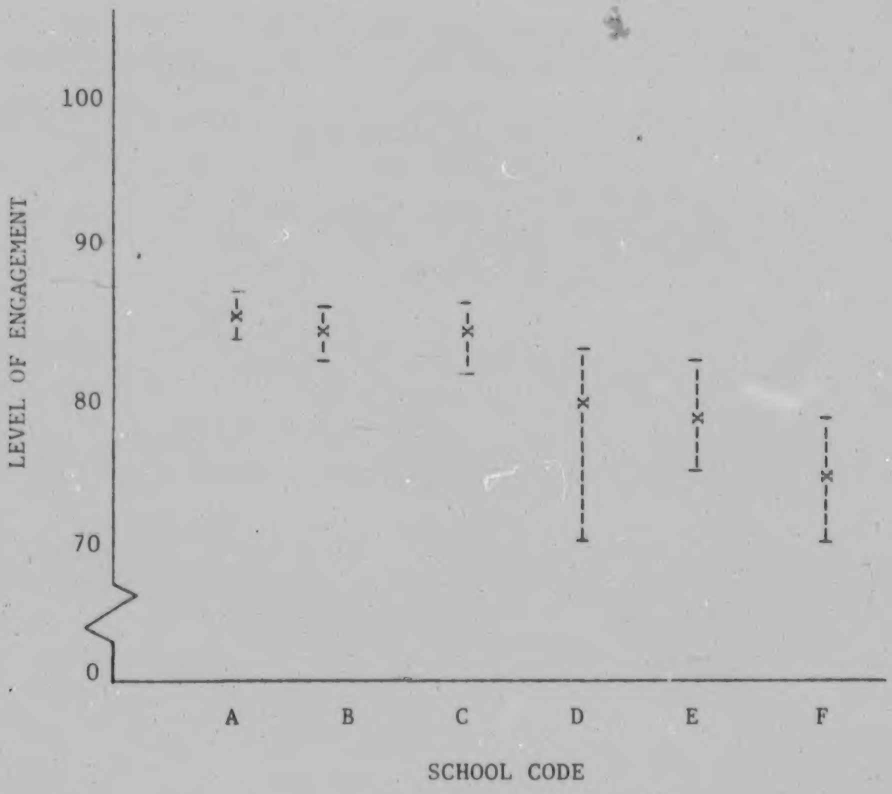

Fig. 1.1. Range and mean level of engagement by school, 1971-72.

of impact scores intended to show, on the average, relative effectiveness of each strategy, across all teachers, in eliciting engagement.

Morton (1973) further investigated the effectiveness of specific strategies on engagement. She conducted training sessions with two teachers that increased their use of two strategies (Personalizes Task and Rewards Individual Achievement) and observed concurrent engagement levels of a student sample in each classroom. Her results showed that although strategy use was increased by training and feedback procedures, variability in engagement levels of students was such that no clear relationship between strategy use and engagement could be demonstrated across five days of observation (two hours each day).

In summary, the results of the first year of data collection were: (a) there were large differences in level and mode (receptive or expressive) of engagement among classrooms and among observation rounds; (b) the frequency of strategy use varied among teachers and for individual teachers from one observation round to another; (c) the mean percentage of students engaged increased significantly during the year; (d) there were no significant differences in level or type of engagement by sex or ethnicity of students, or by subject matter; (e) level of engagement differed significantly by size of instructional group, with lower levels for large groups than for small or dyadic groups; (f) level of engagement in the classroom was not clearly related to the use of particular strategies; and (g) teachers can be trained to increase their use of specific strategies although it was not clear that the difference in usage affected student engagement levels.

Implications of the First-Year Data

Reformulating the conceptualization of the problem and redesigning the methods for the second year of data-gathering were the two major consequences of the first-year results. Three features of the first-phase results required explanation and further investigation: (1) there were consistent differences among teachers in the levels of engagement in their classes, suggesting that in some way teachers were having an impact upon their students; (2) there was little relationship between the frequency of use of teacher strategies and levels of student engagement, suggesting that our initial model of teacher behavior--student response was not sufficient; (3) there was a relationship between a classroom organization variable--size of instructional group--and student engagement, suggesting that our model should be enlarged to accommodate a wider range of sources, specifically contextual or setting variables. The model of teacher behavior--student response was adopted, of course, with full knowledge that other factors affected student engagement, but it was assumed that specific teacher behavior would be so influential that clear relationships would emerge despite inputs from other sources.

What are the possible explanations for the findings of the first phase? We will divide our discussion into methodological and conceptual considerations. Granted, this division is not a clear one in all cases. Methodological considerations here refer to problems in design and data collection during the first phase. Conceptual considerations refer to reformulations of the problem and assumptions that guide research.

Methodological explanations for first-phase findings include several points. One possibility is that the single observer used to record student behavior in the first phase was not able to provide data that distinguished between the students in direct interaction with the teacher and those involved with peers in work groups or working with materials on their own. Obviously, connections between specific teacher behavior during a ten-second time period and a consequent student response are more difficult to detect if some of the teacher behavior observed was directed toward students other than those being observed. It had been our assumption that there would be sufficient instances of teachers relating with the entire class to provide adequate data on direct teacher-student interaction and that the teacher's style and strategies would influence even those students not in direct exchange with her. Neither of these assumptions was well founded. The design of the second year of the study was altered to provide data on both types of students--those in interaction with the teacher and those engaged with peers or materials.

Another consideration touching on the design and methodological aspects of the study was the problem of adequately sampling classroom behavior. The variability of both teacher and student behavior was extreme. It seems possible that such variability is so great that the usual analytic approaches for revealing correlational relationships are too limited to detect those that may exist. This is a possibility that we take seriously. The extreme variability and its implications for research in the classroom are discussed in a separate technical report.

Another methodological explanation is that the categories developed for use in observations were not subtle enough to catch the nuances of tone, temper, expectation, disapproval, and praise that the complex task of teaching requires. Some of the teacher's messages to the class are difficult to detect and our methods may have missed them. Teacher-teacher differences in student engagement appeared but effective ways were not developed to measure and record them. Discrete behavioral categories that were used as the primary measure of teacher behavior may not have captured the more global aspects of teacher influence such as attitudes toward classroom organization, control of students, and teaching.

It may be difficult to classify the "vibes" that form a part of the "mystique" of teacher effectiveness. The analysis of data in this report, however, indicates to some degree how much of the impact of the teacher, as represented by differences among teachers, can be assigned to different aspects of her or his behavior. There is a residue that remains explained but is related to inter-teacher differences. More refined data-gathering techniques and more comprehensive conceptualization may whittle away at this "mystique." We hope these findings make it more susceptible to systematic examination.

Quite apart from these matters of method and design, the findings of the first year suggested changes in the conceptualization of the engagement process itself. The original model of teacher-student interaction and engagement was one of teacher behavior--student response. Obviously, the social dynamics of a classroom are much more complex and subtle. A more adequate model must also accommodate the history of the teacher-class interaction (Ryan, 1970; Smith and Geoffrey, 1968), recognizing that the teacher may set expectations for herself and for the students early in the term and reinforce these intermittently in ways that are not easily detected in short, limited observational periods, even though they are repeated.

It seems reasonable that a teacher has internal expectations about the level of attention she desires as well as a level below which she will not allow it to fall, if possible. It may be that within a zone of attentiveness for the class as a whole, the teacher allows some wandering of attention by a few students. If too many students become tuned out or if one or two show excessive disengagement or disruption, however, she will intervene immediately, sometimes with an emergency tactic of her own choosing. Many teachers told us that they had extreme measures that they used when things threatened to get out of hand, usually some technique on which they could always rely. The technique's effectiveness, however, depended to some extent on surprise and infrequency of use. Such occasional but extraordinary methods, even though effective, would not appear in the analysis of a group of teachers; individual variations were part of the potency of these methods. Also, a teacher might find that on a given day, for various reasons, the techniques she used in more routine situations were different than on a previous day; again, aggregate data tend to disguise these patterns. Teachers have a repertoire of techniques to draw on, and interviews with them suggest that the versatile teacher may pick different tactics to suit different occasions or to adapt to different classes. These techniques are not readily examined in systematic ways, even with the massive amounts of observational data collected in this study.

Another interpretation is that, in addition to specific teacher behavior, more molar or global factors significantly influence the level of student attention. Contextual variables, such as physical arrangement of the classroom, size of instructional grouping, weather, and the like act directly on the students and on the teacher as well. This explanation is consistent with the data obtained during the initial year of the study.

The design for 1972-73 was constructed to permit more systematic examination of some of these possibilities. Teacher attitudes were tapped by several devices; contextual features and student characteristics were sampled over a greater range of variation. Methodological improvements were made, primarily by adding a third observer. This gave more precise information about the direct teacher-student interaction. By good fortune we had the opportunity to observe in a school that planned to shift from self-contained classrooms in trailers to a new open-space building in midyear. This shift also allowed an increase in the total number of observations, treating the self-contained and open-space conditions as separate studies with similar research designs. Data were available from teachers and students at grade levels from kindergarten through sixth grade. The design permitted more precise comparisons of the effects of subject matter (reading/language arts vs. math). The composition of the student body--about half Mexican-American and half Anglo-American students--afforded a more adequate examination of the influence of ethnicity on both teacher and student behavior.

The second-year design thus utilized a more comprehensive model, permitting analysis of more components that might contribute to variance of student engagement. Several serious problems remained, but the more complex design yields information that should be useful to researchers designing studies of classroom teacher-student transactions.

The design of the study's second phase was based on a view of the engagement levels of students as related to several different sources of variation. These variables include: teacher attitudes (toward classroom control, open space, etc.); teacher global instructional strategies (size of instructional group, distinction between students in interaction with the teacher and those oriented toward peers or materials); specific teacher strategies (represented by the teacher observation instrument); and contextual variables (weather, subject matter, open-space versus self-contained rooms); and student characteristics (sex, ethnicity, age, or grade level).

This design draws upon a model of the engagement process as influenced by the school environment and offers the opportunity to identify multiple sources of variability and to study teacher influence in the context of different instructional settings. Thus, teacher and student behavior can be studied within different instructional group sizes or classroom types as well as across settings. The design in this way more accurately reflects the complex and changing dynamic of natural classroom interactions.

CHAPTER 2: DESIGN OF THE SECOND PHASE OF DATA COLLECTION

Second-Phase Objectives

As data from pilot studies and from the first year of field observations became available for analysis, the goals of the project were modified in response to the results. As revised, the objectives of the project were:

1. To identify the specific strategies that teachers use to engage students in natural classroom settings and the relationship of these to student engagement.
2. To study the relationship of contextual variables (size of instructional group, subject matter, school architecture to teacher strategies and to student engagement.
3. To examine the relationship between pupil characteristics (age, sex, ethnicity) and levels of engagement.
4. To contribute, through analysis of variability of student and teacher behavior, to methods of research using classroom observations.

In summary, the central purpose of the study was to identify the sources of variability in student engagement.

The Sample

All observations in the second phase of data collection were made in one elementary school in a city in California. Two factors were important in the selection of this site: the school was scheduled to move from self-contained portable classrooms into a new open-space facility at midyear (providing a unique opportunity to study the same students and teachers in different settings); and the staff, some of whom had participated in the earlier study, expressed interest in the prospect of more research in their classrooms.

The school is located in a marginally low-income area of the city. Census data from 1970 for the surrounding tracts shows that 20 to 30 percent of the families with children under the age of 18 have incomes below the federally established poverty level. The school was receiving Title I assistance from the federal government.

Enrollment figures varied over the school year, averaging about 460 students in grades kindergarten through six. Student turnover was fairly high; school records show 120 new students admitted and 162 withdrawals over the year. About 65 percent of the student body was male; 61 percent was Mexican-American, and 37 percent was Anglo. Table 2.1 shows the distribution, by sex, ethnicity, and grade level, of our student observation instances.

TABLE 2.1

Distribution of Student Observation Instances by Grade, Sex, and Ethnicity

	Sex		Ethnicity		
Grades	Males	Females	Anglo	Mexican-American	Other
K	3316	2415	2372	3250	109
1	3975	4462	3374	4866	197
2	2427	3151	2031	3474	73
2-3	3265	2363	2883	2323	422
3-4	1150	1668	1317	1397	104
4-5	3212	2388	2696	2818	91
5-6	2886	2658	2254	3232	58
6	1894	971	1564	1141	160
Totals	22,125	20,046	18,091	22,471	1214

There were 20 teachers in the school, 18 of whom participated in the study. Observations were made in 15 classrooms where both language arts and mathematics were taught.[1] All of the teachers had considerable teaching experience ranging from five to twenty years; two of them were male. The distribution of teachers and grade levels is shown in Table 2.2.

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[1] In addition, data were gathered from two reading specialists working in the primary grades and from one kindergarten teacher who taught only reading. These data were compiled and used only for feedback on engagement levels and strategy use to the teachers at a workshop in September 1972. Hence, data analyses were carried out on 15 teachers or classrooms.

TABLE 2.2

Distribution of Grade Levels and Teachers

Grade Level	Number of Teachers
Reading Specialists (grades 1-3)	2
Kindergarten	3
First	3
Second	2
Split Second/Third	2
Split Third/Fourth	1
Split Fourth/Fifth	2
Split Fifth/Sixth	2
Sixth	1
Total	18

The move from self-contained portable classrooms to the new open-space facility, scheduled for January 1973, was delayed by construction and weather problems until early March. At that time, there was some reassignment of students and teachers. The two split fifth-sixth classes became one fifth- and one sixth-grade class.

Team teaching was used throughout the year. The school was on double session before the move. Teaming was accomplished by the afternoon teacher arriving approximately one hour before the morning session was dismissed, and by the morning teacher staying an hour to help with the afternoon session. In the open-space building double sessions ended, and teachers at one grade level worked in adjacent areas to facilitate teaming. Another characteristic of the school was the extensive use of aides, both paid and volunteer who were available for every classroom.

Physical conditions in the portable classrooms were cramped and noisy. Teachers complained of disturbing noise levels caused by window air conditioners and by wind and rain on the flat roofs of the buildings.

In the open-space facility only the kindergarten area was enclosed by permanent walls. The carpeted teaching areas were arranged around a media center/library. Temperature was controlled noiselessly by central air conditioning. Some teachers guarded against possible visual distraction by placing bookcases and bulletin boards around their teaching areas, but such blocks were used less by the end of the school year. Noise was not a major problem in the new building; teachers reported that some adjustment in voice level was necessary, but that this was easily accomplished by both teachers and students.

Design

Each of the 15 classrooms in the sample was observed for a total of four hours in the self-contained setting and four hours in open space. Observations were made in 30-minute periods by teams of observers recording student and teacher behavior simultaneously. Observations in self-contained settings were made in October, November, and December 1972, and in February 1973. Open-space observations were made in April and May 1973. The period between observation times in each classroom varied somewhat.

A balanced design was achieved by alternating subject matter for each of the 15 classes. Classes were randomly divided into two groups, with eight in Group I and seven in Group II. Group I classes were observed during mathematics for the first observation period and language arts for the second observation period. Group II classes were observed first in language arts, then in mathematics. Subject matter was thus alternated throughout the 16 observation periods. The result was two hours of observation in each subject matter in each school architectural condition for each classroom.

Classroom Observation Procedures

A team of three observers was in the classroom for each observation period. The first observer recorded teacher behaviors on the Teacher Strategy Instrument. The other observers focused on the students: one (called the *impact* observer) recorded information on those children who

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were in direct interaction with the teacher, while the second (called the class observer) recorded the behavior of students working independently of the teacher. Both student observers recorded behavior on the Student Engagement Instrument. When the teacher was instructing the entire class, both student observers sampled the class using procedures described below.

The addition of a third observer was a major modification in the design of the second phase of data gathering. Observations taken during the initial year did not differentiate between students toward whom the teacher was directing her attention and those involved in activities apart from the teacher. This distinction between Teacher-Directed and Material/Peer-Directed students, respectively, was perhaps the major factor in the difference in findings between the first and second phases of the study.

The three observers were required to record behavior simultaneously in ten-second observation intervals. Each line of the instruments represented ten seconds of time. The observers all worked during identical intervals on all instruments. They wore earphones connected to a tape recorder that emitted a beep every ten seconds. The observers watched for ten seconds, the machine beeped, they recorded what they had seen for ten seconds, the machine beeped again, and they watched for another ten seconds. This procedure was repeated 90 times during each 30-minute observation.

Teachers wore wireless vega microphones during the observation periods. The teacher observer was aided in the identification of strategies by hearing exactly what the teacher said, and the student observers sometimes obtained clues about student engagement from listening to teacher comments.

At the beginning of the next observation interval--that is, every twenty seconds--both observers selected different students and repeated the entire observing and recording process. The impact observer, however, was instructed to observe only students in direct interaction with the teacher. This limited the number of students available for selection and the impact observer chose among them, following a predetermined procedure.

The observers were assigned to classrooms and observer teams by a senior staff member. Scheduling difficulties, which were aggravated by the delay in moving to the new building, prevented the use of a balanced assignment plan. The high interobserver-agreement figures, however, suggest that this did not unduly affect the results of the study.

Observer Training

The skill of the classroom observers was, of course, an important element in the study. Nineteen potential observers (15 women and 4 men) were recruited in August 1972 and went through an intensive two-week training program in September. Most of the candidates had some public school teaching experience. Training was conducted in day-long sessions. Lectures, video tapes, and daily testing and feedback all were important features of the training program,which had been developed by senior staff members.

Criterion testing was done in classes at the sample school before actual observations began. Each potential observer rated student behavior for ten minutes and teacher behavior for ten minutes. Two senior staff members served as calibrators throughout the data collection. One of them made simultaneous ratings on the same children with the observer for ten minutes and then simultaneous ratings on the teacher for ten minutes. The results were then compared for agreement between the observer and calibrator. Observers were given feedback and additional training on categories where needed. After the observers attained an average interobserver agreement of 80 percent on the student and teacher observation instruments, they began data collection for the study.

Two additional calibrations were done in the self-contained and two in the open-space classrooms to obtain interobserver agreement percentages for use as reliability data for the study. After each session, observers were given feedback by the calibrator and other staff members. The observers were retrained in a one-week session in March before the open-space observations began. Two new observers were added to the staff at that time.

Although the project employed a total of 21 classroom observers, a core group of nine, including two staff members, conducted the majority of the classroom observations over the year.

Considerable rapport developed between teachers and observers. Teachers expressed feelings of warmth and approval toward the observers and this ability on the part of the team of observers to maintain cordial relationships with the school faculty kept problems in data gathering to a minimum. See Appendix D on the methods used to establish collaborative relationships between the teachers and researchers during the study.

Interobserver Agreement

Data on interobserver agreement were obtained from the calibrator for the two ten-minute segments which were separate from the regular observations. The calibrator and the two observers rated student engagement behavior simultaneously for ten minutes. Teacher strategies were then observed for ten minutes. Calibration periods included those conducted in September, October, and December 1972, in self-contained classrooms, and in April and May 1973, in open-space teaching areas.

The estimate of interobserver agreement used was the percentage of agreement between the observers and the calibrator over the total observation instances. The agreement percentage was computed for each category on the Teacher Strategy and Student Engagement instruments for each calibration period. Data from all calibrations within a period were combined to obtain the percentage for that period. Mean percentages across all calibration periods were also computed for each category on both instruments. Interobserver agreement percentages are summarized in Table 2.3.

The criterion level for acceptable interobserver agreement was set at 80 percent for all categories on both instruments. Of the 27 categories on the Teacher Strategy Instrument, 21 were above criterion. Agreement percentages for the Student Engagement Instrument categories were all above criterion. Interobserver-agreement percentages for the engagement index, which was the primary dependent variable used in the analyses, were 94 percent for self-contained and 95 percent for open-space classrooms.

TABLE 2.3

Interobserver-Agreement Percentages
for Observation Instruments

Instrument and Category	Means across Calibrations (Self-Contained Classrooms)	Means across Calibrations (Open-Space Classrooms)
Teacher Strategy Instrument		
Stimulus Variation and Change		
U.Vis.A.	93	89
Moves	85	93
E.Man.M.	95	91
Chg.Act.	97	98
Surp.	99	100*
Class Mean	94	94
Task-Structuring		
Sts./Exp.	75	76
Comds.	83	82
Sums.	92	95
P.Tsk.	95	96
Orients	97	98
Choice	99	100*
Class Mean	91	91
Affective		
Pers.	84	88
Listens	72	81
Smiles	94	86
R.I.A.	96	96
Touches	98	95
A.Suc.	99	99
Class Mean	91	91
Discipline		
Displ.	98	96
Con.Pers.	99	98
Con.Tch.	99	100*
Class Mean	99	98
Evaluative		
Quest.	82	81
G.Fdbk.	84	76
Chall.	94	97
F.Comp.	98	99
Tests	99	97
G.Con.Fdbk.	99	98
Class Mean	93	91

TABLE 2.3 (continued)

Instrument and Category	Means across Calibrations (Self-Contained Classrooms)	Means across Calibrations (Open-Space Classrooms)
Administration/ Management		
Adm./Man.	96	96
Class Mean	96	96
Student Engagement Instrument		
Global		
Receptive	84	86
Expressive	85	90
Passive	91	91
Disruptive	94	97
Direction		
Non-Task	89	90
Teacher	79	93
Aide	98	100*
Material	80	92
Peer	97	97
Other Direction		
Other Teacher	96	99
Grouping		
Dyadic	92	95
Small	92	97
Large	92	98
Average/Period	89	93
Engagement Index		
Receptive and Expressive	94	95
Disengagement Index		
Passive and Disruptive	94	95

*Strategy did not occur across all observers and calibrator during calibration periods.

Sources of Variation in Student Engagement

The variables of this study were divided into two main categories. The first included those variables hypothesized to be sources of variation in student engagement, including contextual variables, teacher attitudes, global teacher strategies, specific teacher strategies, and student characteristics. The student engagement measures comprised the second category of variables. Each of these variables will be described in the following section.

Teacher Attitudes

Participating teachers were asked to fill out a detailed questionnaire about their classroom procedures, task structuring, pupil control methods, and attitudes about teaching low-income students while they were in the self-contained classrooms (November 1972) and again in open space (May 1973). The questionnaire was designed to measure (a) orientation toward pupil control, an attitude we hypothesized to interact with environmental characteristics in producing teacher behavior, and (b) teacher sense of effectiveness and satisfaction with teaching, indicators of teacher morale which we hypothesized to be significantly influenced by the interaction of teacher orientation and teaching environment. Attached to the teacher questionnaires were four semantic differential scales: My Classroom in the Portables, Team Teaching, My Classroom in Open Space, and School Rules. Word pairs were selected from Osgood's studies of dimensions in semantic space.

Table 2.4 presents the measures of teacher attitudes and the methods by which they were measured.

Global Teacher Strategies

Two aspects of the way in which a teacher arranges the learning environment were explored. The first was the use of different-sized instructional groups within the classroom. Size of instructional groups was divided into three classifications: dyadic, student is interacting with one other person; small group, student is interacting with a group of eight or fewer people; large group, student is interacting with a

TABLE 2.4

Measures of Teacher Attitudes

Measure	Method of Assessment
Evaluation of Self-Contained Classrooms	Semantic Differential
Evaluation of Open-Space Classrooms	Semantic Differential
Activity in Self-Contained Classrooms	Semantic Differnetial
Activity in Open-Space Classrooms	Semantic Differential
Control Ideology	Questionnaire
Attribution of Responsibility for Student Engagement	Questionnaire
Attribution of Responsibility for Student Achievement	Questionnaire
Preference for Architectural Type	Questionnaire
Management Strategies	Questionnaire

group of nine or more people. The second was the social patterns produced by the way in which the teacher arranges for direction of the student engagement, i.e., whether students were supposed to be directed toward the teacher (Teacher-Directed) or toward nonteacher sources of instruction such as materials or peers (called Material/Peer-Directed).

Information on global teacher strategies was recorded on the Student Engagement Instrument (see Appendix A).

Specific Teacher Strategies

The Teacher Strategy Instrument was developed for the first phase of data collection and revised slightly for the second phase. Most of the strategy categories remained unchanged.[2] The categories were derived

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[2] Although there were 27 strategies on the Teacher Strategy Instrument, only 24 of these were considered for some parts of the data analysis.

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from theory and research which suggested specific teacher strategies possibly related to engagement (see Chapter 1 for discussion of the theoretical and empirical framework) and from interviews with teachers. Observers marked each strategy category that occurred in a ten-second interval. These strategies, definitions, and examples are listed below:

Stimulus Variation and Change Strategies

Uses Visual Aids: Teacher uses visual stimuli to facilitate the lesson, e.g., charts, pictures, overhead projector.

Moves: Teacher moves from one place in the classroom to another in order to facilitate the task or to interact with student in task-related situation, e.g., walks around room from student to student when teaching a lesson.

Encourages Manipulation of Materials: Teacher involves students in activities or tasks requiring the use of materials other than paper and pencil, e.g., geoboards, blocks, cuisinaire rods.

Changes Activity: Teacher initiates change in activity and/or subject matter, e.g., introduces a math lesson by writing examples on the board, then has students work with geoboards.

Surprises: Teacher does something out of the ordinary to arouse the curiosity and attention of her students, e.g., uses poetry to illustrate history of contemporary problems.

Task-Structuring Strategies

States/Explains: Teacher describes or explains task, reads from a book or answers a student's question in informative terms, e.g., "2 + 2 = 4."

Commands: Teacher directs students to do academic tasks using commands or requests, e.g., "Please open your books."

Summarizes: Teacher pulls together and restates some aspect of the lesson or repeats a student's answer, e.g., "Jim says the answer is four."

Personalizes Task: Teacher relates task to students' or her own personal experience(s), e.g., uses student homes to teach map reading or student names to teach alphabetizing.

Orients: Teacher explains what the lesson will be about, how it is related to what the students have learned and what will be expected of them, e.g., tells students about the game they are going to play and why.

Provides Choice: Teacher offers choices to students for self-structuring of tasks, e.g., "Would you like to use the listening center or the math center?"

Affective Strategies

Personalizes: Teacher focuses attention on an individual child, creating a momentarily dyadic relationship with him/her. This can occur even across a classroom, e.g., teacher moves from student to student offering individual help.

Listens: Teacher focuses attention on a student's verbal expression and indicates a real interest and concern. Eye contact is one measure.

Smiles: Facial expression of teacher is one of pleasure and approval, e.g., smiles or laughs while interacting with individual or class.

Recognizes Individual Achievement: Teacher indicates that a student or the class has performed well, has made an unusual contribution, and/or has achieved more than the usual standards of excellence, e.g., "Look at how well Sandra is working."

Touches: Teacher is involved in affectionate physical interaction with student, e.g., hugs child.

Anticipates Success: Teacher communicates expectations for level of success, recognizes ability of an individual or class to succeed, e.g., "I know you can do it."

Discipline Strategies

Disciplines: Teacher directs student to change behavior in relation to the task or non-task activity, e.g., "Please be quiet."

Constrains by Personalizing: Teacher communicates negative affect to the child, e.g., "I don't think you can do it."

Constrains by Touching: Teacher is involved in negative physical interaction with student, e.g., turns student around in desk by arm.

Evaluative Strategies

Questions: Teacher asks a question related to academic subject matter for which there is only one correct answer or a predetermined list of answers not requiring synthesis, e.g., "How do you count to ten in Spanish?"

Gives Feedback: Teacher gives information about the accuracy of a student's responses, either nonverbally or in one to three words, e.g., "Good."

Challenges: Teacher asks a question related to academic subject matter which involves a higher order cognitive processing by the student: (a) considering an open-ended question; (b) weighing alternative possibilities; or (c) synthesizing previously learned information by linking specific information or facts to new answer(s) or question(s), e.g., "What are the ways that we can help save our environment?"

Fosters Competition: Teacher divides class by individuals or groups for motivation for completing tasks and/or purposes of evaluation, e.g., "Whoever is finished first will leave for recess first."

Tests: Teacher gives test in order to assess student proficiency in specific subject matter, e.g, math quiz, spelling test.

Gives Constraining Feedback: Teacher uses negative affect in giving information about the accuracy of a student response, either verbally (one to three words) or nonverbally, e.g., grimace when error is made.

Monitoring Strategies

Teacher directs any strategy toward a child, working independently of her at any time.

Administers/Manages

Teacher makes requests, commands, statements, or questions relating to nonacademic matters, e.g., "Close the door."

Contextual Variables

Contextual variables were classroom architectural condition (self-contained and open space), subject matter (language arts and math), and weather variables (wind speed, barometric pressure, and maximum temperature on observation days), the last of which the teachers in the sample suggested might account for some variation in engagement levels over time. Architectural condition and subject matter were recorded by observers on both the Teacher Strategy Instrument and the Student Engagement Instrument. Observation dates, also recorded on these instruments, were then used to obtain data on wind speed, barometric pressure, and maximum daily temperature from the United States weather station in San Jose, California.

Student Characteristics

Student characteristics used in the data analysis were sex, ethnicity (Anglo and Mexican-American), and age (defined by grade level). This information was recorded on the Student Engagement Instrument (see Appendix A).

Student Engagement Measures

The Student Engagement Observation Instrument was developed to provide behavioral measures of student engagement in classroom learning. Previous work by Miller and Hess (1972) on student engagement with computer-assisted instruction (CAI) provided the basis for this instrument, a copy of which is presented in Appendix A. Thus, the dependent variable, as in the first phase of the project, was level of engagement. The following is a list of behavioral indicators of engagement, their definitions, and related examples:

> Global Receptive Engaged Rating: Student shows visual attention to task, but no motor or verbal activity, e.g., listens to teacher, watches films.
>
> Global Expressive Engaged Rating: Student shows visual engagement *and* motor and/or verbal attention to task, e.g., answers questions, writes, contributes to discussion.
>
> Global Passive Disengaged Rating: Student shows inattention but does not disturb other students, e.g., daydreams, draws pictures instead of writing assignment.
>
> Global Disruptive Disengaged Rating: Student shows behavior disruptive to learning process or task attentiveness of one or more other students, e.g., initiates conversation, makes noises.

A measure of the level of student engagement was computed by dividing the number of observed instances of engagements in the two global indicators combined (global receptive and global expressive) by the total number of observations. Thus, the level of engagement was measured by the percentage of students engaged.

Three different levels of engagement were computed for each observation period. The level of All Directions Engagement was based on the percentage of all intervals in which students were rated as engaged, e.g., if the two student observers collected 180 intervals of student data (the usual number in a half hour) and 142 of these were engaged, the level of All Directions Engagement was 79 percent.

A second level was computed for only those students who were working directly with the teacher. The easiest way to visualize Teacher-Directed Engagement is to imagine a classroom where several small groups of students are pursuing different activities. The teacher works with one of the groups, listening to them read aloud, while the other groups complete seatwork assignments. One of the student observers would focus on the reading group, collecting perhaps 90 intervals of student data. If 80 of these intervals were engaged, then the level of Teacher-Directed Engagement would be 89 percent.

The third level, Material/Peer-Directed Engagement, represents the engagement of students working independently of the teacher, either with materials or other students or peers. In the above hypothetical classroom, the second student observer would collect intervals of data on the students working on seatwork assignments. If 90 such intervals were collected and 72 were engaged, the level of Material/Peer-Directed Engagement would be 80 percent.

CHAPTER 3: MODES AND LEVELS OF ENGAGEMENT

Engagement Modes

Each ten-second observation interval from the Student Engagement Instrument contained an indication of the mode of engagement or disengagement shown by the student being observed. The four possible modes were receptive, expressive, passive, or disruptive. The first two were indications of engagement, the latter two of disengagement. Receptive engagement was defined as passive intake of information, e.g., reading or watching a film. Expressive engagement was more active involvement in a task--writing or reciting. Passive disengagement was defined as inattentiveness that did not involve any other student, e.g., day-dreaming or reading while the teacher lectured. Disruptive disengagement was an action that involved nontask behavior and also distracted other students from a task; an extreme example would be hitting another student, a more usual case was nontask-related conversation.

The student engagement data from the instrument were organized in two ways. First, the percentages of student intervals in each of the modes were arranged by teacher, student sex, and student ethnicity, so that distributions could be compared. Second, the receptive and expressive engagement instances were combined to provide more general descriptions of student attention during an observation.

Percentages of student observations recorded receptive (R), expressive (E), passive (P), and disruptive (D) were computed. The distribution of student observations over the four modes of engagement/disengagement was computed for each teacher, for all teachers, and for both sexes and ethnicities across all of the observation times. Tables 3.1 and 3.2 show the percentage of modes of engagement for each teacher for Teacher-Directed and Material/Peer-Directed engagement. Tables 3.3 and 3.4 show the distributions of modes by sex and by ethnicity of students for all three directions of attention for all observations combined.

Several comparisons can be made from these data. The student sex and ethnicity categories, for example, show few differences within the directions of attention, e.g., for Material/Peer-Directed observations,

TABLE 3.1

Modes of Teacher-Directed Engagement by Teacher
(Percentages)

Teacher	Receptive	Expressive	Passive	Disruptive
3	30.7	64.0	3.4	1.9
5	37.4	60.0	4.5	3.1
6	31.5	58.0	7.0	3.5
7	36.4	48.4	10.8	4.5
8	41.0	47.2	9.2	2.6
9	33.9	41.2	12.7	12.1
10	43.7	50.5	4.4	1.5
11	41.7	48.9	6.7	3.4
12	25.9	59.6	8.1	6.4
13	32.5	61.5	4.0	2.0
14	34.5	54.5	7.5	3.5
15	38.7	53.7	5.5	2.0
16	34.1	53.4	9.0	3.5
17	37.4	47.6	7.5	7.6
18	38.0	49.0	9.0	4.0
All	36.0	52.5	7.5	4.4

TABLE 3.2

Modes of Material/Peer-Directed Engagement by Teacher (Percentages)

Teacher	Receptive	Expressive	Passive	Disruptive
3	5.4	73.8	12.6	8.2
5	5.3	73.4	12.9	8.3
6	8.3	65.5	15.4	10.5
7	19.7	61.9	12.0	6.5
8	22.9	61.2	12.7	3.0
9	7.3	49.8	21.0	21.7
10	18.8	64.9	12.3	4.0
11	11.2	67.9	12.4	8.4
12	11.3	55.9	15.8	17.0
13	9.2	65.2	14.6	10.9
14	5.5	73.4	11.9	9.4
15	11.8	63.9	16.2	8.1
16	8.9	61.6	18.1	12.1
17	8.9	59.0	15.8	17.0
18	11.7	65.2	11.2	11.9
All	10.9	62.9	15.1	11.1

TABLE 3.3

Engagement Modes for Directions of Attention by Student Sex, All Observations Combined (Percentages)

	Teacher-Directed		Material/Peer-Directed		All Directions	
Mode	Males	Females	Males	Females	Males	Females
Receptive	34	39	11	9	26	28
Expressive	54	51	61	60	56	56
Passive	8	7	16	18	11	10
Disruptive	5	3	13	13	7	6
N	12,785	11,117	8,235	7,888	22,130	20,076

N = number of instances.

TABLE 3.4

Engagement Modes for Directions of Attention by Student Ethnicity,
All Observations Combined
(Percentages)

	Teacher-Directed			Material/Peer-Directed			All Directions		
Mode	Anglos	Mex-Am.	Other	Anglos	Mex-Am.	Other	Anglos	Mex-Am.	Other
Receptive	36	37	35	11	11	10	23	24	20
Expressive	52	53	54	63	63	65	58	58	61
Passive	7	7	7	14	15	14	11	11	11
Disruptive	4	3	4	12	11	10	8	7	7
N	9,618	13,645	639	6,999	8,606	518	12,438	16,807	884

N = number of instances.

61 percent of the males and 60 percent of the females were expressively engaged. Similarly, 12 percent of the Anglo students and 11 percent of the Mexican-American students were disruptively disengaged. In these general terms, then, differences among students in modes of engagement are not impressive. The distributions over teachers or classrooms, however, show a different situation. Compare the 12.1 percent disruptive students for Teacher 9 with the 1.5 percent for Teacher 10 for Teacher-Directed observations (Table 3.1). Although students on the average react in roughly the same modes to teachers in general, there is wide variation among classes with different teachers.

Engagement Levels

Engagement levels were computed for the major directions of attention (Teacher-Directed, Material/Peer-Directed, and All Directions) by combining receptive and expressive mode frequencies and computing the percentage of observations they represented. For example, if there were 40 intervals of data for students working independently of the teacher (Material/Peer-Directed) in a half-hour observation period, and 30 of these were recorded as either receptive or expressive, then the level of Material/Peer engagement would be 75 percent for that period.

By combining student data for all of the observation periods, we were able to describe the differences among classrooms. Table 3.5 shows the levels of engagement by direction of attention for each teacher across all observation periods.

Because the observations were taken in natural classrooms without intervention and because of differences in classroom organization, observation frequencies in the directions of attention vary considerably. Table 3.6 shows the frequencies used as the basis for the levels of engagement reported above. These figures are also interesting in themselves as a reflection of differences in teaching styles.

One important feature of the engagement data is the impressive amount of variation in levels among observation periods for each classroom and also among classrooms across periods. For example, Teacher 10 data shows an overall Teacher-Directed Engagement level of 94 percent; when the

TABLE 3.5

Engagement Levels for Directions of Attention by Teacher, All Observations Combined (Percentages)

Teacher	Teacher-Directed	Material/Peer-Directed	All Directions
3	94	79	88
5	92	79	88
6	89	74	82
7	84	82	84
8	88	84	87
9	75	57	66
10	94	84	89
11	89	79	84
12	85	67	72
13	94	74	85
14	89	79	84
15	92	76	85
16	87	70	79
17	84	68	75
18	87	77	84
All	88	74	76

levels of each observation period are examined, however, the range is from 76 to 98. In contrast, Teacher 9 data shows an overall Teacher-Directed engagement level of only 75 percent, the range being from 49 to 100.

Nevertheless, there is some evidence of consistent differences among teachers or classrooms. Spearman rank order correlations for 15 teachers in two conditions (self-contained and open space were .53 ($p < .05$) for Teacher-Directed levels of engagement, .57 ($p < .05$) for Material/Peer-Directed levels, and .84 ($p < .001$) for All Directions.

TABLE 3.6

Number of Student Observation Intervals for Directions of Attention by Teacher

Teacher	Teacher-Directed	Material/Peer-Directed	All Directions
3	1546	848	3192
5	1657	704	3111
6	1550	1275	3510
7	2108	618	3111
8	1645	1078	3087
9	1353	1459	3297
10	1694	1095	3477
11	1384	1325	3535
12	965	1733	3534
13	1503	912	3161
14	1877	871	3272
15	1872	835	3246
16	1483	1234	3332
17	1394	1420	3555
18	1871	716	3028
All	23,902	16,123	49,445

CHAPTER 4: NONTEACHER SOURCES OF VARIATION IN LEVELS OF STUDENT ENGAGEMENT

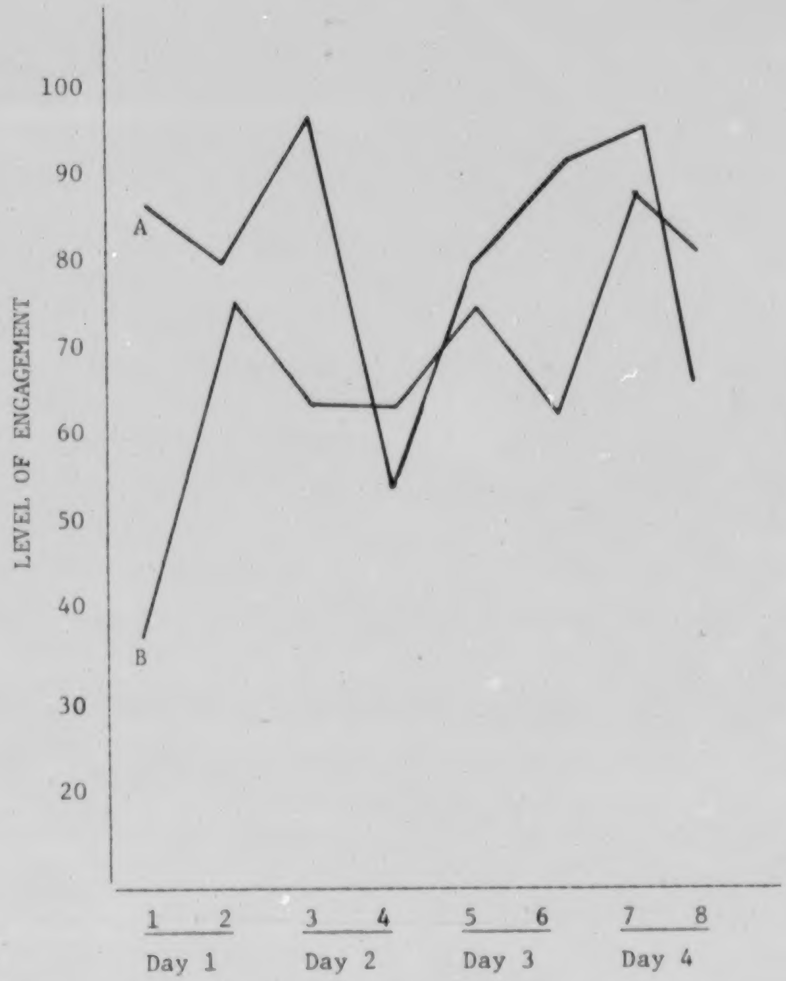
Large variations in levels of student engagement occurred across several parameters included in our design. Individual students vary in level of attention from one moment to another within a single class period, as Morton has shown (1973); there are marked variations for individual teachers across different observational periods on different days and for different observational periods within the same day (Figure 4.1 and Table 4.1); there are striking differences in mean levels of engagement among different teachers in the same school, as well as significant differences in levels of engagement among different schools (see Figure 1.1). In this chapter these variations are described, and analyses are presented in which we attempt to identify the sources of variation--that is, the relationship between variability in student engagement and other variables in our overall design.

The major source of data about the importance of different sources of variability in student engagement comes from a series of stepwise regression analyses using BMD 02R. Data were prepared for these analyses by grouping individual variables into clusters for presentation in five predetermined orders. The orders were varied to provide information about about the variance that might be considered unique and that which might be shared among the clusters. Within each cluster, variables were ordered generally in terms of their individual contribution to the variance. The cluster of teacher attitudes, for example, shows a different arrangement of the individual attitude variables depending upon the particular problem run and upon the order of presentation of the cluster in the analysis.

The design for the regression analysis and the composition of the clusters is as follows:

Dependent variables:

1. All Directions Engagement--means of engagement levels over all directions of student attention for each of the 16 observation periods (30 minutes) for each of the 15 teachers.



OBSERVATION TIME

Fig. 4.1. Variability in engagement level for two teachers for different observation periods within the same day, 1971-72.

TABLE 4.1

Variations in Level of Engagement for Different Observation Periods within the Same Day, for Four Teachers, 1971-72 (Percentages)

	Day 1		Day 2		Day 3		Day 4	
Teacher	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8
6	38	73	63	63	72	63	89	82
12	84	81	96	55	79	87	81	79
18	94	64	94	63	78	92	93	69
24	69	77	87	82	84	73	86	86

2. Teacher-Directed Engagement--means of engagement levels across the same data set but for only those students in direct interaction with the teacher.
3. Material/Peers-Directed Engagement--means across the same data set for only those students directed toward materials or peers.

Independent variables:

Cluster A--Teacher-teacher differences. A procedure was used to obtain differences among the 15 teachers and among the three groups of grade levels (K-1, 2-3, 4-6). These are "dummy" variables in the sense that they do not represent individual teachers but provide information about variability among the teachers.

Cluster B--Teacher attitudes. These attitudes are described later in this report (Chapter 5). They include attitudes toward open space, self-contained classrooms, control ideology, and classroom management.

Cluster C--Teacher strategies. This cluster includes nine specific teacher strategies, selected from the total list of 27 on the basis of their presumed relationship to student engagement. They are changes activity, encourages manipulation of materials, moves, orients, summarizes, commands, questions, rewards individual achievement, and personalizes.

Cluster D--Teacher global strategies. These are use of different sized instructional groups and student direction of attention (Teacher-Directed versus Material/Peers-Directed). As an independent variable this involved the proportion of students directed toward the teacher or toward material/peers.

Cluster E--Student characteristics. Only student sex was included here; grade level is associated with teacher differences and cannot be separately extracted. Estimates of the relationship of engagement to student ethnicity are made from mean levels of engagement.

Cluster F--Contextual variables. These include architectural condition, subject matter, and weather.

The order of presentation of clusters was arranged to give information about patterns of greatest interest. For example, we wanted to see how much variance was related to teacher difference, so Cluster A was entered first on one problem. We were also interested to see how much variance was accounted for by teacher differences after all other variables had been entered, so in another problem Cluster A was presented last. Not all possible permutations were used. Those that were chosen were used across all runs. The five patterns of presentation were:

1. A B C D E F
2. B C D E F A
3. C D E F B A
4. D F C B A E
5. F E D C B A

The analyses were computed to respond to nine different major problems (runs) which combined the three different independent variables with architectural condition and direction of student attention. This gave the following problem sets:

1. All Directions Engagement in both architectural conditions.
2. All Directions Engagement in self-contained classrooms only.
3. All Directions Engagement in open space only.
4. Teacher-Directed Engagement in both conditions.
5. Teacher-Directed Engagement in self-contained.
6. Teacher-Directed Engagement in open space.
7. Material/Peer-Directed Engagement in both conditions.
8. Material/Peer-Directed Engagement in self-contained.
9. Material/Peer-Directed Engagement in open space.

In runs using architectural conditions separately or directions of attention separately, these variables were taken from their appropriate clusters. Similarly, in runs using Teacher-Directed (or Material/Peers) Engagement, direction of attention was eliminated. Global strategies, then, for the Teacher-Directed Engagement problems was limited to size of instructional group.

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In the discussion that follows, we use the results of these analyses to estimate percentage of variance accounted for by these clusters in different positions in the order of presentation. For example, if teacher attitudes add nothing to the variance accounted for by teacher differences when preceded by teacher differences, we conclude that this cluster has no unique contribution to make that is not represented by Cluster A. When entered first, however, teacher attitudes seem to show a degree of shared variance that indicates that cluster's probable importance as a source of some of the variance among the teachers in the study.

The design variables can be grouped into two categories: those that can be altered or manipulated by the teacher or are part of her individual characteristics and those that operate somewhat independently of teacher effects. This chapter deals with the second of these general groups. It includes: student characteristics (sex, ethnicity, age as indicated by grade level) and contextual variables (architectural condition--self-contained or open space, subject matter, weather). Chapter 5 is an analysis of the contribution of teachers to levels of attention in their classes.

Variance Attributable to Student Characteristics

The contribution of student characteristics to levels of attention in the classroom is a matter of fundamental importance to issues of teacher responsibility and accountability. If it were to be shown, for example, that students of a given age, sex, or ethnic group were consistently more (or less) attentive or were typically more disruptive or tuned out, the teacher might be released from some measure of responsibility for the engagement levels in her class. Although the kind of data available on student characteristics is limited, there is some information on this point.

The characteristics of the students in our study seemed to contribute only a very small amount to the level of and variability in engagement. There are probably differences among individual students that might come from psychological states or from the ability to deal with the subject material presented in class, but we have no information on these variables. Nor can we estimate the possible relationship between level of attentiveness and the socioeconomic background of the student's family. The characteristics on which we do have data, however, are those that might reasonably be expected to show differences in levels of engagement--ethnicity, sex, and age (grade level).

Ethnicity

In both of the two years of study, we observed students from more than one ethnic group. For both years, the differences between ethnic groups in mean levels of engagement or of disruptive behavior were very small (Tables 4.2 and 3.4), expecially when compared with school-to-school differences (1971-72), teacher-to-teacher differences, and the effects of the size of instructional group on engagement.

Sex

Similar results were obtained from the analysis of differences between girls and boys in levels of engagement and disruption (Tables 4.3 and 3.3). These descriptive statistics are supported by the results of the ANOVA (analysis of variance) and regression analysis (reported in more detail later), where the percentage of males in the class contributed 1 percent or less to the total variance across different conditions of instruction and type of physical classroom arrangement. Although it is true that a few more boys than girls were rated "disruptive," the actual numbers involved were small. It may be that a relatively small number of disruptions (say, three boys in a class compared with two girls during a 30-minute period, Table 3.3) creates an impression that boys are more likely to be disengaged; it is not reasonable to conclude from our data that sex differences in attentiveness are of significance in these classrooms.

Grade Level

Differences in grade level are available only for the second of the two years we observed. The data are mixed, and conclusions must be tentative. In general, the level of engagement changed little from the

TABLE 4.2

Mean Level of Engagement by Ethnicity, All Teachers Combined,
1971-72 and 1972-73
(Percentages)

		1972-73			
Ethnic Group	1971-72	TD/SC	MP/SC	TD/OS	MP/OS
Anglo	79 (7870)	87 (5126)	77 (3159)	91 (4492)	72 (3840)
Mexican-American	74 (5509)	86 (6621)	74 (3821)	92 (7024)	73 (4785)
Black	74 (1478)				

Note: Numbers in parentheses indicate observation intervals. TD = Teacher-Directed; SC = self-contained; MP = Material/Peer-Directed; OS = open space.

TABLE 4.3

Mean Level of Engagement by Sex, All Teachers Combined,
1971-72 and 1972-73
(Percentages)

		1972-73			
Sex	1971-72	TD/SC	MP/SC	TD/OS	MP/OS
Male	79 (7962)	85 (6635)	75 (3731)	91 (6150)	69 (4504)
Female	81 (8124)	88 (5442)	77 (3508)	92 (5675)	76 (4380)

Note: Numbers in parentheses indicate observation intervals. TD = Teacher-Directed; SC = self-contained; MP = Material/Peer-Directed; OS = open space.

lower grades (K-1) to the higher grades (4-6) (Table 4.4). There does seem, however, to be a drop in expressive engagement and a rise in receptive engagement (see Table 4.5). In the regression analysis and the ANOVA, grade level and teacher differences are confounded and, although there are different patterns of variance at different grade levels, these cannot, with assurance, be assigned to the age of students involved. Compared with sex and ethnicity, however, it is not as clearly a non-contributing factor.

Taking the three student characteristics in total, we conclude that their contribution to levels of engagement is much less important than other factors. One especially significant aspect of these findings is the similarity in engagement levels of students from differing ethnic backgrounds. One question that arises in discussions of inner-city classrooms (which often have students from low-income or minority backgrounds) is whether there are differences among teachers in their ability to engage minority students. The lack of ethnic differences in levels of engagement

TABLE 4.4

Mean Level of Engagement by Grade, by Direction of Attention, by Architectural Condition, All Teachers Combined (Percentages)

	All Directions		Teacher-Directed		Material/Peer Directed	
Grade	SC	OS	SC	OS	SC	OS
K-1	85	88	89	94	79	77
2-3	84	84	89	89	76	76
4-6	78	79	81	92	75	70

Note: 5 teachers in each grade-level grouping; SC = self-contained; OS = open space.

TABLE 4.5

Mean Level of Engagement by Grade, by Direction of Attention, and by Mode of Engagement, All Teachers Combined
(Percentages)

	Teacher-Directed				Material/Peer-Directed				All Directions			
Grade Level	R	E	P	D	R	E	P	D	R	E	P	D
K-1	34.6	57.8	5.7	2.9	7.4	70.2	12.7	9.8	27.9	58.4	8.6	5.0
2-3	35.2	53.4	8.1	3.4	12.0	63.2	15.5	9.3	26.5	56.9	11.0	5.7
4-5	37.3	49.0	8.1	5.6	13.4	59.8	15.1	11.9	25.9	53.8	11.4	8.9
ALL	35.8	53.1	7.3	4.1	11.0	64.2	14.4	10.5	26.7	56.1	10.4	6.9

Note: R = Receptive engagement; E = Expressive engagement; P = Passive disengagement; D = Disruptive disengagement; 5 teachers in each grade-level grouping.

suggest that ethnicity itself is not the central factor in student engagement. We would argue that the reports of disruption and disengagement in some inner-city schools, to the extent to which they are true, are probably related to the larger social context in which the students live and go to school rather than to their ethnic background, sex, and age. In more straightforward terms, Black and Mexican-American students were not significantly more disruptive or less engaged as groups than white students. We conclude, then, that in situations where Black students are less engaged in the educational process, it is not because they are Black but is a result of the pervasive political, social, and economic conditions under which they live. It does not follow, of course, that teachers can necessarily create a classroom climate or a school culture that will neutralize the effects of nonschool conditions. Rather, our data seem to us to indicate that the locus of the discipline problem, where it exists, is not in the ethnic backgrounds of the students involved.

Variance Attributable to Contextual Variables

Although the central purpose of the study was to identify those teacher behaviors--techniques, skills, strategies--that aroused and maintained student interest, other features of the students' environment were also possibly related to whether or not they were attentive to the teacher. The results of the initial year of data collection and analysis persuaded us that specific teacher acts were not closely associated with student engagement. For the second year of the study, alterations were made in the design to include more molar variables and to examine in particular the effects of subject matter and of self-contained as opposed to open-space arrangements in the classroom. In the discussions we had with teachers about factors affecting engagement, one of the most frequent comments was that the weather on any particular day helped set a mood of restlessness, irritability, or concentration. Following this lead, we obtained weather measures for those days on which observations were made and included these data in our analysis.

Subject Matter

In our second-year design, subject matter was limited to two areas--math and language arts. This emphasized the possible effect of content rather than the format of the activity, which would have been a major factor in subject areas such as art or music. Observations were counterbalanced: roughly half the teachers were first observed teaching math and then teaching language arts; the remainder were first observed in language arts, then math. The level of student engagement did not vary appreciably from one subject to another (Table 4.6). This supported our preliminary findings of the first year, which, although based on less systematic data-collection procedures, showed little in the way of subject-matter variations. In the regression analysis, subject matter accounts for relatively little of the variance. It draws most (10 percent) in the Teacher-Directed, self-contained situation, where it is forced into the equation before teacher variables. This suggests some interaction between teacher and subject matter. Once teacher variables (including size of

TABLE 4.6

Mean Level of Engagement by Subject Matter, by Direction of Attention, and by Architectural Condition, All Teachers Combined, 1971-72 and 1972-73 (Percentages)

		1972-73			
Subject	1971-72	TD/SC	MP/SC	TD/OS	MP/OS
Language Arts	78 (6325)	84 (6056)	77 (3552)	91 (6177)	71 (4241)
Math	79 (5129)	89 (6021)	74 (3687)	92 (5648)	74 (4643)
Reading	84 (3003)				

Note: Numbers in parentheses indicate observation instances. TD = Teacher-Directed; SC = self-contained; MP = Material/Peer-Directed; OS = open space.

instructional group) are entered, the additional contribution of subject matter drops to less than 3 percent. In other problem sets (open space, Material/Peers-Directed, All Directions) it pulls less than 1 percent of the total variance.

Architectural Condition

The impact of the move from self-contained, portable units to a new open-space building was, we thought, almost certain to be dramatic. The differences in physical resources, architecture, availability of stimuli from other students and teachers, together with the new experience of the open areas and freedom of movement would seemingly affect both student and teacher behavior. There were certainly some differences in organization, patterns of activity, and other features of the school, but these did not appreciably change the overall level of student attention and engagement in the tasks of the classroom (Table 4.7).

There was, however, an interaction with one of the global strategies: level of attention for Teacher-Directed students increased in open space as compared with a decrease in engagement level for students in the Material/Peer-Directed settings. Even so, in the Teacher-Directed situation, for both self-contained and open-space observations, the variance

TABLE 4.7

Mean Level of Engagement by Direction of Attention and Architectural Condition, All Teachers Combined (Percentages)

Direction of Attention	Self-Contained Classrooms	Open-Space Classrooms
All Directions	82	83
Teacher-Directed	86	91
Material/Peer-Directed	76	72

accounted for by architectural condition is only 10 percent. This effect seems to be restricted to Teacher-Directed contacts; the amount accounted for in the Material/Peer-~~Directed~~ instructional setting was less than 1 percent, even when it was forced into the regression analysis sequence before other variables.

Another way to examine the effects of self-contained versus open-space classroom architecture is through the amount of variance in each condition and the amount that the variables in the regression analysis can account for. Table 4.8 presents the data on these two points.

It appears from these data and from the results of the ANOVA that the effects of architectural condition on engagement are not similar for Teacher-Directed and Material/Peer-Directed. For Teacher-Directed engagement, there is more variability in self-contained units and more of that variability is related to the factors examined in this study. For Material/Peer-Directed engagement, there is also more variability in the self-contained condition, but less of it is explained by variables in the equation.

TABLE 4.8

Total Variance and Percentage of Assignable Variance in Engagement by Direction of Attention and Architectural Condition (Regression Analysis)

Direction of Attention	Condition	Total Variance	Percent of Assignable Variance
All Directions	Self-Contained	68.938	67.7
All Directions	Open Space	91.225	76.9
Teacher-Directed	Self-Contained	81.337	69.2
Teacher-Directed	Open Space	44.428	51.8
Material/Peer-Directed	Self-Contained	570.875	20.1
Material/Peer-Directed	Open Space	230.706	43.1
All Directions	Both Conditions	80.009	65.5

A closer look at the relative contribution of different types of factors to the total variance adds an interesting perspective. Table 4.9 presents the amount of variance accounted for by the following factors when forced first into the program sequence of analysis: teacher differences, teacher attitudes, specific instructional strategies, and global strategies (in this instance limited to size of instructional group, except for the All Directions measure).

Again, an interaction between physical classroom structure and direction of attention is apparent. As noted before, the effect of architectural condition is different for Teacher-Directed and Material/Peer-Directed. But it is of greater interest that the variance accounted for by specific strategies used by the teacher seems to be most involved in the shift. The impact of the specific strategies on students in

TABLE 4.9

Percentage of Variance Assignable to Four Types of Teacher Effects by Direction of Attention and Architectural Condition (Regression Analysis)

Direction of Attention	Condition	Teachers (total)	Teacher Attitudes	Specific Strategies	Global Strategies
All Directions	SC	52.8	29.8	29.4	17.4
All Directions	OS	53.9	27.5	27.4	38.8
Teacher-Directed	SC	44.4	14.6	37.0	17.7
Teacher-Directed	OS	25.5	08.3	14.8	17.8
Material/Peer-Directed	SC	12.9	03.4	03.1	01.5
Material/Peer-Directed	OS	29.4	07.8	15.6	02.1
All Directions	Both	49.7	16.2	27.1	27.8

Note: SC = self-contained; OS = open space.

Material/Peer settings is very low in self-contained classes; in open space, specific strategies affect both Teacher-Directed and Material/Peer settings. This effect is independent of the fact that teachers tend to use some of these strategies less in one condition than in the other.

The influence of open-space classroom arrangements in this study must be interpreted as the initial response of the students and teachers to the open situation. The entire school moved to the new structure in March; our observations were taken in late April, May, and early June. It is possible, therefore, that teachers who were in open space for longer periods of time might change to a stable pattern somewhat different from our own results. These data obviously indicate the early reaction to this sort of change. It might be noted, however, that for some strategies the frequency of usage did change appreciably during the eight open-space observations. A report of the effects on teachers and students of open versus self-contained classrooms appears in a separate research memorandum.

Weather Effects

Largely in response to teacher comments about the effects of rain, wind, and cloudiness on the mood of the children, some simple measures of weather conditions were examined for possible relationship to levels of engagement. Up to 7 percent of the variance in some settings was accounted for by weather when forced first. The contribution of weather was significant across several settings--Teacher-Directed, self-contained, and Material/Peer-Directed, open space--suggesting that whatever effect there may be is applicable to both teachers and students. The fact that weather had only slightly more effect in self-contained units (during the fall and winter) than in open space (during spring months in which there was little rain) casts some doubt on the validity of the data. The measures used were crude, however, and did not utilize potentially more important information, such as the change in pressure and temperature, and we would be inclined to believe that weather did indeed affect levels of engagement and thus constitute a variable worthy of more systematic study.

CHAPTER 5: TEACHER INFLUENCES ON LEVELS OF STUDENT ENGAGEMENT

The two categories of teacher techniques assumed to be related to engagement were specific activities or strategies initiated by the teacher during the course of a lesson, and global strategies, represented not by specific behavior but by the way in which the teacher organized the social setting where instruction took place.[1]

Variance Attributable to Differences Among Teachers

The original purpose of our study was to identify the techniques that teachers used in their classrooms to arouse and maintain their students' attention. The complexity of classroom interaction reflected in the data moved us to utilize a multivariate approach in the search for links between specific teacher acts and levels of student engagement. This chapter summarizes the most relevant data in this area and the conclusions we made.

A major finding of the second phase of the field study was that the specific strategies used by teachers in the classroom are significantly related to engagement levels. The finding was in contrast to the findings of the first phase (see Chapter 1). Because of modifications in data-collection procedures and related data analyses, in the second phase we were able not only to determine relationships between teacher influence and engagement but also to estimate the relative contribution of three aspects of teacher influence and specify to a degree the conditions under which these relationships held.

The method for examining the relationship between specific strategies and student engagement was to use as the independent variable the accumulated frequency with which a given strategy occurred in each of the observation periods and to use as the dependent variable the mean level of student engagement for the observation periods. This procedure had one drawback in that the engagement level during the period might be expected to follow a sequential pattern in which higher engagement would follow a pattern of teacher strategies or a burst of student arousal would be stimulated by some particular teacher behavior. Our data, which are based on one or two simultaneous observations of engagement during any ten-second interval, do not provide the depth for this sort of sequential analysis over time.

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[1] For descriptive information about teacher behavior referred to in this chapter, see Appendix C.

Whatever their impact on student achievement, teachers appear to make a difference in the levels of engagement they maintain in their classrooms. Depending on the condition in question, differences among teachers contribute from 8 percent to 44 percent of the total variance in student engagement. In terms of the share of variance that can be accounted for by all variables, teacher-teacher differences account for one-third to two-thirds of the total.

Table 5.1 presents the percentage of variance that can be accounted for by differences among teachers in mean levels of engagement. The variance accounted for by teacher influence in Teacher-Directed settings decreases from 44.4 percent to 25.5 percent in the shift from self-contained to open-space classrooms. On the other hand, in Material/Peer-Directed settings, the variance accounted for by teacher influence increases from 12.9 percent to 29.4 percent. These differences will be discussed in more detail later in the chapter.

Another view of teacher-teacher differences is seen in the degree of consistency with which teachers are ordered, in terms of student engagement, in both self-contained and open-space settings. Table 5.2 presents the mean levels of student engagement by teacher in each classroom condition. Spearman rank order correlations for 15 teachers in two conditions were .53 ($p < .05$) for Teacher-Directed; .57 ($p < .05$) for Material/Peer Directed; and .84 ($p < .01$) for All Directions. There is some shifting of ranks, but the central feature of these data is that teachers do differ in their ability to engage students and that these differences are relatively stable across classroom conditions.

TABLE 5.1

Percentage of Variance Accounted for by Differences among Teachers in Mean Levels of Engagement

	Total Variance Accounted for by		
Direction of Attention and Architectural Condition	All independent variables (R^2)	Differences among teachers, entered first	Differences among teachers, entered after all other independent variables
Teacher-Directed, Both Conditions	59.8	23.9	10.4
Teacher-Directed, Self-Contained	69.2	44.4	09.7
Teacher-Directed, Open Space	51.8	25.5	08.9
Material/Peer-Directed, Both Conditions	20.0	08.4	11.8
Material/Peer-Directed, Self-Contained	20.0	12.9	08.5
Material/Peer-Directed, Open Space	43.1	29.4	14.0

The finding that teachers differ in their ability to engage students is essential to the question of what specific things they do that arouse and maintain attention. The goal of the study, however, was to identify the specific strategies that are influential in the engagement process. The second question we attempt to answer here, then, is what part of the variance can be linked to teacher influence (more specifically, to teacher attitudes, and to global and specific strategies) that were observed in the classroom.

TABLE 5.2

Mean Levels of Engagement in Self-Contained and Open-Space Classrooms by Direction of Attention and by Teacher (Percentages)

Teacher	Teacher-Directed Engagement		Material/Peer-Directed Engagement		All Directions Engagement	
	SC	OS	SC	OS	SC	OS
3	92(3)	97(1)	81(5)	78(7)	87(3)	90(2)
5	91(5.5)	94(5)	80(6.5)	78(7)	88(2)	89(3.5)
13	92(3)	96(3)	78(8)	72(10)	85(6.5)	86(7.5)
14	87(8.5)	91(8)	76(10)	81(4.5)	83(10)	88(5)
18	84(11)	90(9)	82(3.5)	74(9)	83(10)	85(9)
7	82(13)	87(14.5)	82(3.5)	81(4.5)	83(10)	86(7.5)
15	93(1)	92(7)	69(13)	83(1)	85(6.5)	89(3.5)
6	90(7)	89(10.5)	77(9)	71(11)	84(8)	81(11)
16	87(8.5)	88(12.5)	73(11)	67(13)	81(12)	78(12.5)
11	91(5.5)	89(10.5)	80(6.5)	78(7)	86(4.5)	84(10)
8	85(10)	93(6)	89(1)	82(2.5)	86(4.5)	87(6)
10	92(3)	96(3)	85(2)	82(2.5)	89(1)	91(1)
9	69(15)	88(12.5)	66(14)	53(15)	68(15)	64(15)
12	77(14)	96(3)	65(15)	69(12)	70(14)	78(12.5)
17	83(12)	87(14.5)	79(12)	66(14)	76(13)	77(14)

Note: SC=self-contained; OS=open space; numbers in parentheses are ranks. Teachers are grouped by grade level.

To answer this question and to examine the relative contribution of our different sets of independent variables in accounting for teacher-teacher differences, we designed a series of regression analyses. In these analyses, independent variables were submitted in clusters (student characteristics, teacher attitudes, global teacher strategies, contextual variables, and specific teacher strategies) and forced into each analysis in a pattern of predetermined order. This design made it possible to compare the variance accounted for by each cluster and to estimate the amount of variance attributable to teacher-teacher differences after all other clusters of variables were forced to enter the regression. Table 5.1 shows, in the last column, the percentage of teacher-teacher variance that was not explained by our other independent variables.

Variance Attributable to Teacher Attitudes

The midyear move of the sample school from self-contained to open-space classrooms provided the opportunity to examine the effects of an interaction of classroom architecture and teacher attitudes on teacher and student behavior. We selected two types of attitudes that relate directly to the impact of this shift in physical setting. Attitudes toward architectural condition relate to teachers' satisfaction with the settings in which they teach. The second is their attitudes toward classroom management and organization, the aspect of teaching most directly affected by the move to open space.

Attitudes toward Architectural Condition

Included in the teacher questionnaire (see Appendix B) were four semantic differential instruments. The teachers' responses to two of these--the referents being "my classroom in the portables" and "my classroom in open space"--are indicative of their feelings toward these teaching settings. A factor analysis of the eleven word pairs comprising the instrument yielded strong "evaluative" and "activity" factors. Indices were constructed by averaging the responses to the three word pairs that loaded most heavily on a factor across all referents. Thus the "evaluative" index is the average of a teacher's responses to the word pairs pleasant-unpleasant, good-bad, and chaotic-organized. The "activity" index is the average of a teacher's responses to the word pairs quiet-active, calm-excited, and slow-fast.

Attitudes toward Structure and Management in the Classroom

The Student Engagement Instrument was intended to be used in comparable manner across all teachers' classrooms. That is, behavior indicating disengagement in one classroom also was marked as disengagement in another. This procedure ignored the fact that teachers differ greatly in their tolerance for overt nonattention. The manner in which a teacher organizes her classroom and the control strategies she employs are partly a reflection of her tolerance for noise and movement within the room. We had begun to see the classroom as a climate established by a teacher through her selection of organizational and control strategies. The type and amount of overt disengagement permitted in a given classroom is then a function of that teacher's individual standard of what constitutes acceptable levels of attention and distraction. Therefore, we included in the teacher questionnaire both a measure of attitudes toward different types of classroom structure and an attitude index specific to control of student movement and interaction.

Control ideology. The Control Ideology Scale, devised by Leuders-Salmon (1972), was used to obtain information about the attitudes of the sample teachers toward patterns of classroom organization. The scale was composed of nine five-point Likert-type items (see Appendix B). Three of the items were as follows:

1. Children get distracted when other activities are going on around them.
2. Children can learn from small group discussions without the help of an adult.
3. It is good for the child to have his activities scheduled for him.

A teacher is characterized as "informal" in his orientation if he favors giving pupils choices and opportunities to move about the room and work independently. A teacher who favors retaining control of pupil movement and choice of activity is termed "formal." On the Control Ideology Scale, the more formal a teacher's response, the higher his score.

Management strategies. Indices of teacher attitudes concerning management of pupil movement and interaction were constructed from Questions 5, 6, 15 and 16 on the teacher questionnaire (Appendix B). These questions asked the teachers to describe their strategies for management of pupil movement or interaction by choosing one of four alternatives which varied systematically in degree of formality. For example, Question 5 read as follows:

> When students are working individually on math lessons (you are not lecturing), which of the following descriptions applies? (Check one only)
>
> _____ a. A student in my classroom usually is allowed to approach and intereact with any student in the room.
> _____ b. A student in my classroom usually is allowed to interact with students in his/her work group.
> _____ c. A student in my classroom is usually expected to talk only with students in his immediate vicinity (next to, in front of, etc.)
> _____ d. A student in my classroom usually is expected not to talk with another student without asking permission from myself or another adult.

The alternative responses to each question were coded from 1 to 4, a higher number indicating a more "formal" management strategy (e.g., in the example above, a=1, b-2, c=3, and d=4). The management strategy index for a teacher comprised the sums of his coded responses to Questions 5, 6, 15, and 16. The range of possible scores was thus 4 (most informal) to 16 (most formal).

Do teachers' attitudes toward classroom structure and the environment in which they teach help account for teacher-teacher differences in student engagement levels? We examined a series of regression analyses in which the cluster of teacher attitudes was entered first. As can be seen in Table 5.3 teacher attitudes accounted for 3 to 15 percent of the total variance in student engagement, depending on architectural condition and direction of attention.

Do attitudes account for a part of the variance in student engagement that is attributable to teacher-teacher differences? The regression analysis series in which attitudes were entered immediately following the teacher-teacher effects shows that the effect of attitudes becomes zero in four of the six cells (see Table 5.4. It appears that differences between teachers that are significantly related to student engagement levels are reflected in the teachers' attitudes toward classroom management and structure and toward the setting in which they teach.

Is the effect of teacher attitudes mediated by the specific and global strategies for which we had indices? We examined the regression analysis series in which the attitude cluster was entered after every other cluster except teacher-teacher differences. Table 5.5 shows the percentage of variance accounted for by attitudes after the variance attributable to specific and global strategies and contextual variables has been removed. After comparing Table 5.5 to Table 5.3, we conclude that is primarily in self-contained classrooms, for Teacher-Directed Engagement, that the teacher strategies and contextual variables we examined show evidence of mediating the influence of teacher attitudes on student engagement.

Variance Attributable to Global Teacher Strategies

One of the primary ways in which teacher influence is mediated in the classroom is in the organization of the student's learning environment. The two global strategies used in our analyses were the size of instructional group and the direction of student attention. The first of these included: dyadic or one-to-one interaction between the teacher and a student or between two students; small groups, at least two or not more than eight students; and large groups, nine or more students. Direction of Attention was divided into two categories: students who were supposed to be directed toward the teacher (Teacher-Directed) and those who were supposed to be engaged with materials or working on a project with peers (Material/Peer-Directed).

Instructional Group Size

As indicated in the data from the first year of the study, level of student engagement is related to instructional group size (Table 5.6).

TABLE 5.3

Percentage of Variance in Engagement Accounted for by Teacher Attitudes, When Teacher Attitudes Are Entered First in Step-Wise Multiple Regression, by Architectural Condition and Direction of Attention

Condition	Teacher-Directed Engagement	Material/Peer-Directed Engagement
Self-Contained	14.6 (69.1)	03.4 (20.1)
Open Space	08.3 (51.9)	07.8 (43.1)
Both	05.1 (59.6)	01.2 (19.8)

TABLE 5.4

Percentage of Variance in Engagement Accounted for by Teacher Attitudes, When Teacher Attitudes Are Entered after Teacher-Teacher Differences, by Architectural Condition and Direction of Attention

Condition	Teacher-Directed Engagement	Material/Peer-Directed Engagement
Self-Contained	00.0 (69.1)	00.0 (20.1)
Open Space	00.0 (51.9)	00.0 (43.1)
Both	03.8 (59.6)	06.7 (19.8)

Note: Numbers in parentheses indicate total percentage of variance in engagement accounted for in that cell by all independent variables entered in the regression (see Table 5.1).

TABLE 5.5

Percentage of Variance in Engagement Accounted for by Teacher Attitudes When Teacher Attitudes Are Entered after All Other Independent Variables Except Teacher-Teacher Differences, by Architectural C[illegible]n and Direction of Attention

Condition	Teacher-Directed Engagement	Material/Peer-Directed Engagement
Self-Contained	09.7 (69.1)	04.9 (20.1)
Open Space	08.8 (51.9)	05.6 (43.1)
Both	06.2 (59.6)	01.9 (19.8)

Note: Numbers in parentheses indicate total percentage of variance in engagement accounted for in that cell by all independent variables entered in the regression (see Table 5.1)

The effect is as expected. Students in one-to-one interaction with the teacher are almost certain to be engaged. Those in small groups are usually closer to the teacher and more frequently in eye-to-eye contact or other direct interaction with her. In large groups, students can more easily become inattentive without evoking a direct response from the teacher and her attentio[illegible]ore diffused. The general tendency for students in large instructional groups to be less engaged than those in small groups and dyadic situations is also supported by the results of the regression analysis. For the regression problems in which size of instructional group (Table 5.7) was entered first, the variance accounted for by this variable ranges up to 22 percent for Teacher-Directed Engagement. In such instances, classroom architecture adds little as a source of variation, suggesting that the effects of open space versus self-contained classrooms are mediated to a degree through the use of smaller instructional groups.

One of the obvious features of the data in Table 5.7 is that the influence of instructional group size on level of student engagement is not independent of other aspects of the classroom social and physical structure, specifically the direction of student attention. The marked drop in proportion of variance attributable to group size when other factors are considered first, suggests that group size does not stand by itself, even within direction and condition, but is an indication of other interactions between the teacher and students. Group size thus seems to represent, in part, certain specific teacher behaviors. If it were possible to extract its unique contribution to the total variance (which it is not), it seems probable that group size would have a significant contribution, slightly smaller than the contribution of specific teacher strategies. This result reverses the findings of the first year of the study. The primary reason for the reversal was our capability in the second year to distinguish between students in direct interaction with the teacher and those who are not.

The influence of group size on Material/Peer-Directed students is very small indeed, no matter where it is forced into the equation. The data from the study's first phase obviously mingled data which when kept separate turn out to permit a distinction between the effects of teacher strategies on students in varying instructional settings.

The interpretation of the influence of group size on engagement has ignored, so far, the distinctions between dyadic and small-group situations. From the data in Table 5.6 comparing dyadic with small- and large-group interactions, it is apparent that students in dyadic interaction are almost always engaged, as would be expected. This modifies, of course, the interpretation of the influence of group size in different settings, since dyadic interactions are relatively consistent in level of engagement across condition, direction, grade, and student characteristics. Dyadic interactions show small teacher-teacher differences as well as within-teacher differences over time.

TABLE 5.6

Mean Level of Engagement by Instructional Group Size, by Direction of Attention, and by Architectural Condition (Percentages)

Direction of Attention	Group Size					
	Dyadic		Small		Large	
	SC	OS	SC	OS	SC	OS
Teacher-Directed	99 (4660)	98 (3185)	90 (2026)	90 (1506)	85 (5139)	81 (7386)
Material/Peer-Directed	99 (423)	100 (207)	77 (2349)	79 (974)	69 (6112)	74 (6058)

Note: Numbers in parentheses indicate number of observation instances; SC=self-contained; OS=open space.

TABLE 5.7

Percentage of Variance Accounted for by Instructional Group Size (Regression Analysis)

Direction of attention and architectural condition	Entered before other teacher variables	Entered after teacher attitudes and specific strategies	Entered after other teacher variables
Teacher-Directed, Both Conditions	22.0	14.4	10.7
Teacher-Directed, Self-Contained	17.7	06.5	04.1
Teacher-Directed, Open Space	17.8	19.0	12.5
Material/Peer-Directed, Both Conditions	01.3	01.3	01.9
Material/Peer-Directed, Self-Contained	01.5	01.1	01.1
Material/Peer-Directed, Open Space	02.1	04.3	04.0

Direction of Student Attention

The direction of attention prescribed for students by the teacher is related to level of engagement in both self-contained and open-space classrooms (Table 5.6). The size of the difference is partly a function of group size. The greatest difference is between Teacher-Directed and Material/Peer-Directed in large groups in self-contained classrooms, where 85 percent of students in Teacher-Directed settings were engaged while only 69 percent of students in Material/Peer-Directed settings were attentive. Small-group settings show even more disparity in proportion of students engaged.

There is a contrast, too, in the influence of direction in the two architectural conditions. In the open-space condition, direction of attention as well as group size has its greatest effect on engagement. Table 5.8 summarizes the percentage of variance attributable to both group size and direction of attention in self-contained and open-space situations.

For the regression problems in which direction of student attention is entered first, this variable accounts for a small amount of the variation in student engagement (9 percent) in self-contained classrooms, and for 29 percent of the variation in open-space classrooms. This suggests that direction of attention may be a more important factor in engagement in open space than in self-contained classrooms. When teacher variables are entered into the equation first, however, direction of student attention does not account for a significant percentage of the variance in student engagement, except in open-space classrooms where it accounts for 7 percent of the variance after specific teacher strategies are considered. These results again point to the necessity of considering teacher influences in relation to different instructional contexts. The results suggest that, although direction of student engagement may be an important factor in the open-space classroom, it is not a critical factor for the self-contained classroom.

TABLE 5.8

Percentage of Variance Attributable to Global Strategy Variables by Architectural Condition

Global Strategy Variables	Self Contained		Open Space	
	Entered First	Entered after Teacher Variables	Entered First	Entered after Teacher Variables
Group Size	08.6	00.6	10.0	10.0
Direction of Attention	08.8	02.7	28.8	07.1

Variance Attributable to Specific Teacher Strategies

To obtain estimates of the effectiveness of specific techniques in promoting student engagement, nine strategies (of the total 27) were selected for inclusion in the regression analyses; using the following criteria: (a) relation of strategies to available literature on open-space classrooms or curiosity arousal, (b) evaluation of reliability and validity of strategies, (c) correlation of strategies with student engagement (Pearson correlation coefficients for strategy use and Teacher-Directed Engagement), and (d) low versus moderate or high frequency of use.

In designing the regression analyses, independent variables were submitted in clusters and forced into the analysis in a pattern of predetermined order. Within each cluster, however, variables were allowed to float and were entered in order of magnitude of correlation with the independent variables. This design made it possible not only to examine the contribution of these nine strategies as a group in comparison with other cluster types, but also to examine the order of variables within the strategy cluster to see what was the relative contribution of individual strategies in the several different problems and sequences included in the regression problems subjected to computation.

It would be useful to know how much the specific strategies mediate or convey teacher influence that is also expressed in attitudes or in more global approaches. Is more information gained by including such specific measures of teacher behavior or can teacher impact be predicted as efficiently by using only more global and more easily obtained measures? When the specific strategies cluster of variables was entered after the cluster of teacher attitudes (see Table 4.9), there was relatively little reduction in the variance attributable to specific strategies. Global teacher strategies, whether in Material/Peer-Directed or Teacher-Directed interactions, show a consistently different pattern. Here the contribution of specific strategies is reduced considerably when global strategies are forced into the equation first. This "residual" accounted for by specific strategies is probably the best estimate of the power of specific strategies to explain variance in the data we have. It is a significant amount of this variation but is apparently less than other contributing clusters.

It should be emphasized that these nine variables represent only a portion of the total number of specific strategies. If others could be included (which was not feasible in our design) the total amount of variance accounted for might be larger and the contribution of specific teacher strategies might be relatively greater. In any case, the specific teacher acts as we observed them are linked with student engagement.

It is apparent from these data that the total amount of variance attached to teacher-teacher differences varies greatly from one problem to another. The greater contribution of teachers to the All Directions groups of problems possibly reflects the difference in engagement level between the two directions of attention (Teacher-Directed and Material/Peer-Directed) and individual teachers' tendencies to use these two approaches in quite different proportions, as described previously. The effect of individual teacher abilities to engage students is much more apparent in Teacher-Directed observations than in those in which students are working on their own (Material/Peer-Directed). It is this greater specificity in observing teacher-student interaction that provided the more productive data in the second phase of the study. Across both self-contained and open-space conditions the teacher effects are much more impressive in Teacher-Directed measures than in Material/Peer: there is a reversal in pattern for architectural conditions. Teacher differences account for more variance in self-contained settings when Teacher-Directed measures are examined; they account for more in open-space settings for Material/Peer measures.

The impact of specific strategies follows a quite different pattern. When entered first in the regression analysis, specific strategies account for roughly comparable amounts of variance in Teacher-Directed settings as they do in the more general All Directions data set. This supports the interpretation that the greater contribution of teacher-teacher differences in All Directions comes from the global rather than specific strategies. Indeed, it is in the most specific setting--Teacher-Directed Engagement in self-contained classroom--that the highest proportion of variance is found (37 percent). This is a setting in which we would expect the specific teacher strategies to be most concentrated, and it is no surprise that they were more diffused in the open-space situation.

A further question about the impact of specific strategies is concerned with the relative contribution of the individual strategies themselves. The cluster of teacher techniques used in the regression analyses included ten strategies. These were allowed to float, making it possible to examine the contribution of individual teacher strategies to levels of student engagement. Table 5.9 shows the zero order correlations between frequency of strategy use and levels of student engagement for all strategies, scross all observation periods, within condition, for the 15 teachers. These correlations are typically quite low. There is some consistency across the two architectural conditions.

The contribution of individual strategies to the variance in student engagement is shown in Table 5.10. This table includes data from two regression problems--Teacher-Directed, self-contained, and Teacher-Directed, open space. In both problems, selected specific strategies as a group were forced into the equation before all other variables.

TABLE 5.9

Pearson Correlation Coefficients for Strategy Use in Teacher-Directed Engagement by Architectural Condition, All Teachers Combined

Strategy	Self-Contained (120 pairs)	Open Space (120 pairs)	Both Conditions (240 pairs)
U.Vis.A.	-.04	.05	.02
Moves	-.27**	-.19*	-.29**
E.Man.M.	.36**	.23*	.27**
Chg.Act.	.05	-.01	.03
Surp.	.09	.04	.05
Sts./Expl.	-.21*	-.23*	-.16
Comds.	.23*	.27**	.25**
Sums.	-.12	-.11	-.01
P.Tsk.	.10	.09	.09
Orients	.15	.03	.15
Choice	.07	.16	.14
Pers.	.23*	.10	.20*
Listens	.05	.06	.12
Smiles	.11	-.04	.01
R.I.A.	.30**	.16	.21*
Touches	.06	.17	.001
A.Suc.	-.004	.03	-.03
Displ.	.11	-.25**	-.06
Con.Pers.	-.13	.06	-.07
Con.Tch.	-.05	-.10	-.07
Quest.	-.03	.03	-.01
G.Fdbk.	.14	.03	.09
Chall.	-.06	.09	.03
F.Comp.	.06	.16	.11
Tests	.02	-.10	-.02
G.Con.Fdbk.	.01	-.07	.02
Adm./Man.	.03	.02	-.01

*p < .05, two-tailed test of significance.
**p < .01, two-tailed test of significance.

The total contribution of teacher strategies is concentrated in a relatively small number of the ten strategies entered into the equation. Some (Orientation, for example) contribute virtually nothing to the total variance in student engagement. The importance of a given strategy, however, changes from self-contained settings to open space, although there is some consistency across the two conditions.

Given the shift in pattern of the data in Table 5.10 from self-contained to open space and the relatively small magnitude of the variance accounted for in most instances, we cannot rely heavily on these data for drawing conclusions. One pattern in the data, however, seems to be worth mentioning. The strategies that seem to contribute most in self-contained classrooms are those that deal with individual contacts between student and teacher (Rewards Individual Achievement, Encourages Manipulation of Materials, Moves, and Personalizes). In the open-space situation, however, there are other strategies that also play a significant role (Commands, Summarizes, and Changes Activity). The common-sense interpretation of this shift is that in open-space settings, the teacher structures the learning situation more (or more often) and may provide a social structure to take the place of limitations that had been imposed by the confinement of the self-contained classroom. We offer this as an interpretation that might be worth future consideration. Again, it seems that the effect of open space is to rearrange the pattern of classroom social organization, regardless of its effect on teaching effectiveness.

TABLE 5.10

Percentage of Variance Attributable to Specific Teacher Strategies in Teacher-Directed Settings by Architectural Condition

	Architectural Condition	
Specific Strategy	Self-Contained	Open Space
Chg.Act.	00.0	01.4
E.Man.M.	08.6	01.8
Moves	05.7	01.5
Orients	00.4	00.0
Sums.	00.4	01.5
Comds.	00.2	07.3
Quest.	01.0	00.0
R.I.A.	18.8	01.1
Pers.	01.9	00.0

CHAPTER 6: SUMMARY AND CONCLUSIONS

The conclusions we draw from this study follow both from the questions originally incorporated in the design and also from unexpected features of the data that impressed us in the course of our analysis. The questions raised in the study were related to the attempt to identify sources of variation in student engagement in the classroom. Since the clusters of independent variables included in the regression analysis (see Chapter 4) accounted for very large proportions of variance in some of the problems (up to 77 percent; see Table 4.8), the summary of results is organized around this topic. Particular attention is given to the teacher as a specific source of influence.

The major findings of the study are as follows.

1. Teacher-teacher differences account for the largest percentage of variation in student engagement. The amount of variation attached to teacher-teacher differences changes from one setting to another but these differences are clearly more significant in their total impact than any other source of variation.

There is the possibility, of course, that the unique combination of students in these particular classes also contributed to the differences between teachers. Perhaps these might properly be called between-classroom differences. Several aspects of the data, however, argue against this explanation. First, the specific and global strategies teachers use in the classroom are related to engagement levels across different observation periods. Second, teacher attitudes appear to explain much of the teacher-teacher variance, leaving roughly 10 percent not identified or explained. Some of this variance might have been accounted for by other specific teacher strategies--only 10 of the total of 27 were used in the regression analysis. Some of the variance might have been related to attitudes, if they could have been measured more systematically and in depth. Third, data are available from two teachers who participated in both years of the study. Although they had different classes during these two years and reported to us that there were large differences from one year to the next in the effort required to maintain attention, the mean levels of engagement in these different classes during the two years were almost identical. These arguments do not entirely dismiss the possibility that random classroom differences may explain some of the variance among teachers, but the contribution from this source seems not to be as great as the influence of individual teachers.

At this point we believe that teachers have their own individual "zones of comfort" of student attentiveness and that they establish expectations about what is permitted and what is not. Students may "tune out" temporarily in some classes and display some disengagement without concern on the part of the teacher; in other classes, students learn that even small signs of inattention will trigger a response from the teacher. Teacher-teacher differences, then, may reflect both variations in ability to engage students and variations in the level of attention demanded by the teacher.

2. The specific strategies that teachers use in direct interaction with students are related to engagement levels. This relationship between teacher behavior and student engagement was, of course, the initial question of the study. The impact of specific teacher behavior varies from one strategy to another and from one setting to another, but clearly what teachers do through their specific techniques is related to the engagement levels of their classes. This result is similar to findings based on the data of the national longitudinal study of Follow Through, which indicate teachers' instructional techniques account for a large percentage of the variance on specific skill criteria (approximately 25 percent) over that attributable to student ability (Cooley and Emrick, 1974).

3. There is no easily defined pattern of high- or low-engaging teachers; teacher uniqueness and individuality are evident despite large differences in effectiveness. Although some specific strategies seem to be associated with high levels of engagement across teachers, it seems likely that individual teachers have their own patterns. In short, there are several different ways to successfully engage students. Strategy profiles of successful teachers show marked differences one from another; profiles of teachers whose students have low levels of engagement also show striking dissimilarities (see Table 6.1).

TABLE 6.1

Strategy Usage for Two High-Engagement Teachers (10 and 15) and Two Low-Engagement Teachers (7 and 9) by Architectural Condition (Percentages)

	High-Engagement Teachers				Low-Engagement Teachers			
	Self-Contained		Open Space		Self-Contained		Open Space	
Strategy	10	15	10	15	7	9	7	9
U.Vis.A.	35.4	21.6	47.4	39.0	46.9	39.1	50.4	20.6
Moves	34.0	52.4	16.9	48.6	32.8	46.5	23.9	37.5
E.Man.M.	18.7	27.3	9.7	20.6	6.6	2.1	2.8	-
Chg.Act.	4.3	4.1	2.6	3.6	1.6	.6	2.6	.6
Surp.	2.4	12.9	-	1.5	-	-	-	-
Sts./Expl.	23.4	40.2	51.5	37.7	37.4	57.9	46.1	61.0
Comds.	26.6	41.9	23.5	38.6	20.2	20.0	22.2	26.0
Sums.	10.4	11.0	20.1	19.9	13.9	11.8	19.9	11.6
P.Tsk.	1.5	4.5	5.7	1.9	6.9	1.9	.4	.1
Orients	5.8	2.0	6.0	8.9	3.7	.3	3.2	4.2
Choice	1.0	.1	-	.1	-	-	-	-
Pers.	69.8	70.1	57.2	74.5	63.5	67.6	74.7	85.8
Listens	46.1	47.8	50.1	63.0	50.1	49.9	68.5	67.5
Smiles	2.6	16.0	1.0	15.2	9.4	2.4	8.2	.8
R.I.A.	8.6	15.2	4.7	11.4	4.2	.4	7.5	.3
Touches	1.4	5.5	.4	4.7	3.7	2.3	2.2	1.0
A.Suc.	1.3	.6	.6	.6	1.2	.9	.3	.1
Displ.	2.4	1.7	1.3	2.8	6.7	12.0	4.6	8.8
Con.Pers.	.4	.1	-	-	1.2	1.7	.3	.4
Con.Tch.	-	.3	-	.3	.1	.4	.3	.8
Quest.	37.9	44.1	45.0	40.0	46.3	37.8	44.4	31.9
G.Fdbk.	21.2	16.4	9.7	19.9	16.3	18.4	17.5	22.1
Chall.	5.4	2.9	.8	4.6	4.2	4.0	4.2	4.0
F.Comp.	6.4	3.5	1.0	5.3	.3	-	5.4	-
Tests	5.6	-	3.5	-	-	.1	-	.1
G.Con.Fdbk.	.1	-	1.3	-	.3	-	1.3	-
Adm./Man.	2.9	2.8	1.3	3.9	4.0	1.3	1.3	.7

Note: Percentages are averages of strategy use within intervals across periods.

4. Level of student engagement is strongly related to the global strategies teachers use in their classrooms. This is one of the clearest and perhaps most important findings of the study. Our original model of teacher behavior--student response was based on a conception of the teacher and her specific instructional behavior as the central source of influence on student behavior. Our data, however, have led us now to believe that classroom organization and the use of global interactional strategies may be even more important in influencing engagement levels.

The two global strategies we examined were instructional group size and direction of student attention (toward the teacher or toward materials and peers). Both of these strategies have strong relationships to student engagement and are also related to the operation of other variables. If one wanted to change both teacher and student behavior, it would be more effective, we believe, to manipulate the global aspects of the instructional setting rather than to instruct teachers in new specific teaching techniques. The features of the educational environment, especially the patterns of interaction between students and teachers, may be more productive areas of change.

5. The attitudes that teachers hold toward certain aspects of the teaching environment are associated with student engagement levels. This part of the study was developed and measured in less specificity and depth than some others because the teacher attitudinal instruments were intended to measure change in attitudes toward open-space classrooms rather than to explain variance in student engagement. Nonetheless, teacher attitudes toward the physical and organizational environment in which they teach show a significant relationship to engagement and contribute to the variance even after specific and global teacher strategies have been entered into the equation (see Table 5.5). The attitudes that most consistently relate to engagement are those toward open space and toward the degree of formality in classroom structure. It seems likely to us that a more systematic measurement of teacher attitudes toward aspects of informal classroom structure such as student movement, interaction, and choice of activity would show more substantial contributions to the variance in student engagement levels.

[redacted]

6. The association of any specific teacher behavior or attitudes is modified by the situation in which the instruction takes place. More specifically,

a. The association of instructional group size with engagement is markedly different for Teacher-Directed situations than for Material/Peer-Directed situations.

b. The percentage of v[redacted]nce accounted for by teacher-teacher differences varies from self-contained to open-space conditions.

c. The association of a specific strategy (such as Rewards Individual Achievement) with engagement varies from self-contained to open-space conditions.

d. The association of specific teacher strategies with student engagement is very different [redacted]ed than in Material/Peer-Direc

e. The relationship of teacher behavior to engagement in Material/Peer-Directed situations changed when the classes moved to open space. That is, the mean level of engagement did not vary so much as did the relationship between teacher behavior and engagement in these settings.

f. The relationship of teacher attitudes to student engagement in Teacher-Directed situations decreases from self-contained to open-space classrooms; the contribution of attitudes to engagement in Material/Peer-Directed situations increases in open space.

The interaction between specific teacher behavior and the contextual features of the instructional setting makes it difficult to argue that there is an ideal pattern of teacher strategies or techniques that will be successful in engaging students in all settings. Our data make it apparent that teachers strongly influence their students' engagement levels. They do not do so by using a relatively stable pattern of behavior that they have learned will work across a variety of situations. It is not a consitent style. Rather, teachers seem to adapt their behavior to new situations (as indicated by the changes in strategies used in open space as compared with self-contained classrooms). In short, although teachers affect student engagement, the process through which their influence is mediated is very complex and is linked to the demands and opportunities of a given instructional setting.

7. The move to open space from self-contained classrooms is related to teacher behavior and patterns of student engagement but has little

relationship to overall levels of student engagement. A primary reason for selecting this particular school for the second year of the study was the evidence from the results of the first phase suggesting that classroom organization and other contextual variables might have stronger influences on student engagement levels than did the teachers' specific techniques. Since the school planned to move from self-contained to open-space school architecture, it seemed to offer an opportunity in which the impact of change in physical organization on classroom behavior would be obvious and perhaps dramatic.

The effect on overall level of student engagement was minimal (mean level, All Directions, for self-contained classrooms was 82 percent; mean level, All Directions, for open space was 83 percent). There were consequences of the move, but they appeared in the engagement pattern of different situations within the classroom. Engagement levels in Teacher-Directed situations rose (from 86 percent to 91 percent); levels of engagement in Material/Peer-Directed situations dropped (from 76 percent to 72 percent). The move to open space did apparently affect teacher-student interaction. The proportion of dyadic interactions between teachers and students increased from roughly one-third to about one-half; the proportion of interactions with large groups decreased by about the same amount. Classroom architecture, at least in the first few months after the move, had a complex pattern of relationships with the behavior of both students and teachers. As a source of variation in student engagement, however, classroom architecture had only modest impact.

8. Teacher-teacher differences in student engagement are moderately stable across different classroom and instructional settings. The rank order of teachers in terms of mean levels of engagement in self-contained classrooms is significantly correlated with their rank order in open space for both Teacher-Directed and Material/Peer-Directed instructional settings. When both types of engagement are combined, the rank order correlation is highly significant (Rho= .85, $p= < .01$). This stability in rank order is significant despite the small differences in mean levels of engagement among several of the teachers. Seven of the fifteen teachers were between 90 and 93 percent, for example, in mean level of Teacher-Directed

Engagement in self-contained classrooms; nine were in this range in the open-space setting (Table 5.2).

9. Student engagement levels during the two years of the study are relatively independent of the sex, ethnicity, and age (grade level) of students. This finding is based on observations of 39 teachers and their classrooms. During the first data-gathering phase, classrooms included Black, Mexican-American, and Anglo students, with a few students of other ethnic groups. Examination of ethnic and sex differences for both years showed little difference in engagement levels or in frequency of disengagement. We conclude, then, that it is the environment of the school and of the community and the relationship between school and community rather than the ethnicity or sex of students that are responsible for the extent of engagement or disruption in the classroom.

Implications for Research on Teaching

Importance of Classroom Organization

The implications of our findings on classroom organization are among the most important and most useful of the study. Only two types of organizational patterns were identified for observation, but they are of interest in themselves and suggest that other forms of social patterning in the instructional setting may also shape the interaction between the student and the classroom environment in ways that affect his attention and perhaps his ease of learning.

To summarize our most important conclusions about size of instructional group and direction of student attention:

1. Students are more engaged in small instructional groups than in large ones.
2. The relationship of the size of instructional group to student engagement varies with the setting. (Group size does not apply to students in Material/Peer-Directed situations.)
3. Students directed toward the teacher are more likely to be engaged than are students directed toward other students or toward materials on which they are working alone. This is especially true of boys and in open-space settings.
4. Disruptive disengagement (as contrasted with passive disengagement) increased in Material/Peer-Directed situations--from 4.4 percent to 11.1 percent (see Tables 3.1 and 3.2).

These classroom organizational effects are related to one another and to other features of the total context, such as architectural condition. All of these are linked to the teachers' use of specific strategies in ways that cannot be completely unravelled, given the design of the study.

A paradigm for research on teaching should take seriously the interaction of setting or context with teacher and student behavior. Our results indicate that the search for relationships between teacher and student behavior *in vacuo* can lead to only partial understanding or none at all. Generalizations of the findings must be referenced to the specific instructional setting. Thus there is a need for developing appropriate techniques for measuring critical environmental and situational variables that are at least as reliable, valid, and precise as those techniques that now exist for measuring individual variables (Cronbach, 1957; Schulman, 1970).

Future efforts in the development of the theory of and research in teaching must take this work into account. More effort is needed in the characterization and measurement of educationally relevant features of the classroom social and physical environment and the interrelationships of these features with teacher and student behavior.

Issue of Variability in Classroom Observational Data

Another aspect of the data that carries some implications for research design is the variability of observations of both student and teacher behavior. Almost all facets of the data--frequency of strategy use, level of classroom engagement for a given observation period, teachers' use of a particular global strategy such as size of instructional group--show relatively great variability from one observation period to another. Moreover, the amount of variability, as indicated by the regression analysis or analysis of variance, changes from one architectural condition to another. For example, behavior in open space is less variable than in self-contained classrooms.

This variability in ratings or in indices that originated in observers' check marks is to some degree a product of the variability of the rating and recording process--the less-than-perfect agreement among different observers and less-than-identical judgments made over similar events by a single observer. The relatively high agreement among observers in the study, however, suggests that much of the variation in both teacher and student behavior is a feature of the behavior itself, not merely measurement error. If this is so, the unevenness in the data presents severe problems for the researcher who is pursuing evidence of relationships between teacher behavior and student response. One example of the consequences of extreme variability in levels of student engagement is that the number of measurements needed to establish that teachers differ in their ability to engage students is obviously much larger than would be needed to establish teacher-teacher differences in more stable types of behavior. The variability in the data of the study and its implications for research in the classroom are discussed in a separate report and are only noted in passing here. The problems created by variability, however, have something in common with the difficulties psychologists face in the study of personality (Fiske, 1974, 1973) where lack of specificity in the definition of concepts and behavior (following primarily from reliance on words) and the nature of the data establish limits on the progress that can be made.

Multivariate Approach for Research on Teaching

The analytic approach employed in this study enabled us to assess the contribution of several clusters of variables to the dependent student variables with which we were concerned. A multivariate approach is more appropriate for the analysis of the complexity of the teaching and learning process as it exists in the natural classroom.

Implications for Educational Practice

Teacher Training

The results of this study indicate that teachers differ in their abilities to engage students in learning. Specific teacher strategies were also found to be related to levels of student engagement. Together these conclusions might suggest that teachers can be trained to engage students more effectively. Two cautionary points, however, need to be considered in the design of teacher-training programs for the purpose of influencing student engagement.

Morton (1973) attempted to train teachers to use selected specific strategies for the purpose of affecting levels of student engagement. Teachers were observed and their effective strategies for engaging students were identified. A program of training was designed to increase the use of these specific strategies. Ten students in each classroom were observed for two days after the teachers increased their use of these strategies (Rewarding Individual Achievement and Personalizes). Although Morton showed that teachers can be assisted to change or at least to increase the use of specific kinds of behavior in the classroom, this change did not appreciably increase the average level of student engagement. To be sure, the variability in student behavior was such that it would be difficult to detect average increases in engagement on a relatively short-term basis; long-term effects might emerge. Her data do not make this a likely interpretation, though it remains a technical possibility. Thus, the results of Morton's study indicate that although teachers can be assisted to identify effective engagement strategies and to increase their use, this does not necessarily lead to higher levels of engagement.

In addition, we have already noted that teachers who are high engagers have individual, perhaps unique strategy profiles in the classroom. Although there are some similarities (necessarily, since use of specific techniques correlates with level of engagement), there are many individual teacher differences. Likewise, patterns of strategy use differ among teachers who are low engagers (see Table 6.1).

These two considerations do not lead to recommendation of special training programs to assist teachers in developing skills for engaging students in their classrooms, at least not with respect to specific instructional and management strategies. If it is true, as these data indicate, that the relationships of specific teacher behavior to student engagement cannot be predicted in advance without knowing something of the parameters of a particular instructional setting, training teachers in specific teaching skills (Borg et al., 1970), while ignoring the context which may support or limit their effectiveness, may miss the mark. On the contrary, these findings suggest the manner in which the teacher arranges the social environment of the classroom can potentially optimize the effectiveness of her specific techniques and her students' engagement. Thus the planning of classroom settings can be one of the teacher's most potent strategies in influencing her students' engagement. There is a great need, then, to develop teacher skills in classroom social organization which parallel those developed for teacher skills in questioning and explaining.

Teachers might find the results of this study useful in two ways: first, the information about the effects of global strategies, such as direction of attention and group size, the relationship of physical environment to teacher behavior, and the lack of ethnic and sex differences in student engagement would provide information that experienced teachers would be able to use in their own ways. This could increase their confidence in their own resources and help them select approaches compatible to their circumstances.

Second, on the basis of our experience with teachers in the study, we are convinced that teachers can make better use of information and feedback about their own behavior than they can make of training programs designed to change teacher behavior in predetermined directions without consideration of classroom contexts or obvious individual teacher differences in behavior.

Evaluation of Teacher Effectiveness

Our discussion of the implications of the study for teacher training is related to political pressures for the evaluation of teacher effectiveness. The findings of this study suggest caution in the evaluation of teachers based on existing research on teaching. While the findings indicate that teachers can be held accountable for their instructional behavior (see Cooley and Emrick, 1974), there is not likely to be a universal set of behavior which for every teacher is related to student behavior. Furthermore, the instructional purposes and setting must be taken into account in examining linkages between teacher and student behavior. Clearly the observation of teachers for the purposes of the evaluation of their effectiveness involves procedures which require further development.

The Open-Space School

The findings of the study also have some implications for classroom and building planning. These results are conceivably of interest to principals as well as teachers, since the planning for social organization of the school and, to a degree, of the classroom is a matter of joint concern.

The move to open space from self-contained units was the major organizational change in the school in which the second year study was conducted. A great deal of preparation had been made for this move: the school was planned, architecturally, by a committee that included teachers and parents. The move thus was anticipated and, for the most part, desired by the community and the school staff.

In summary, the most important results of the move to the open-space school were:

1. The overall relationship to student engagement was minimal. Architectural condition accounted for some variance in Teacher-Directed Engagement but virtually none in Material/Peer-Directed.
2. The move was related to the pattern of engagement--Teacher-Directed Engagement increased; engagement levels in Material/Peer-Directed students declined.
3. Teachers tended to use large-group instructional settings less often in open space (about a third of the time), than in self-contained classrooms (about half of the time) in both Teacher-Directed and Material/Peer-Directed situations.
4. The move to open space was related to the teachers' use of several specific strategies. Some of these changes are apparently directly related to the physical arrangements of the classes in the two conditions. Teachers tended to use Moves less and Listens more in open space. This represents the shift from a setting in which the teacher moved around the room among students to one in which the teacher established a "teacher station" to which students came with questions and problems (see also Resnick, 1970).
5. The use of Disciplines as a strategy declined slightly in open space, suggesting that the greater visual and spatial freedom did not create more problems of classroom management.

6. The experience in open space was a positive one for teachers, and their attitudes toward it became increasingly favorable within the few months after the move.
7. The impact of classroom social organization was increased by the move to open space. In self-contained classrooms, the difference between engagement level in Teacher-Directed and Material/Peer-Directed situations was 10 percent (86 percent vs. 76 percent). In the open-space condition, this difference was doubled (91 percent for Teacher-Directed and 72 percent for Material/Peer-Directed.

Although this is a relatively positive report on the shift to open space, it needs an important cautionary note. Our data come from the period of initial experience with the new setting for these teachers and students. The school moved from self-contained portable units to the new building in March, and we conducted our observations within two months after the move. These data, then, represent the first phase of response to open space. Informal evidence, principally from conversations with teachers, suggest that the adaptation to open-space architecture may take place over several months and that both faculty and students increase in their ability to use it effectively. We guess that attitudes will become more enthusiastic and that the initial caution on the part of some teachers will disappear.

Our purpose is not to make recommendations about the advisability of open space as a choice for schools and communities. There are other considerations to be taken into account. One of these is the degree of preplanning and inservice training that teachers and staff receive before moving to an open-space school. We believe that the positive report on our sample school was a consequence of the preparation on the part of teachers and principal to enter the new school. Given these necessary cautions, our conclusions may be helpful in evaluating the potential effects of open space on student engagement and teacher behavior.

Research in Low-Income Schools--A Proposal for the Future

This study began with a concern for the quality of education provided in schools serving students from minority and low-income backgrounds. One implication of our two-year study in these schools was the recognition, supported by our data, that low-income schools are not homogeneous entities which can be characterized and dealt with in similar ways. Whether they serve low-income or middle-income families, schools differ from one another in the quality of education provided to students.

What makes for school-to-school differences in the engagement and achievement of students? This is a question researchers have attempted to answer for some time (Coleman, 1963). What the study findings strongly suggest is that to understand academic success and failure it is necessary to go beyond the individual teacher and her classroom to the social organization of the classroom and of the school and its staff, and to their relationships to the community in which the school is located. Using the methodology of an ethnographic case study, Rist (1972) argues that the social milieu of the school, which is represented by the values and behavior of teachers and administrators, affects the environment of the classroom and hence the educational experience of the students. The quality of administrative leadership, the professional ideology and expectations of the teachers for the students, and the support system for the teaching activity by the teacher's peers and administrators interact to produce qualitatively different social milieus which may contribute to school-to-school differences in engagement. Hence, the third phase of the study, were there to be one, would extend the cluster of variables to include school districts and local schools in the existing design. It would also probe more systematically to provide an empirical basis for the correlates of school-to-school differences in student engagement.

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APPENDIX A

TEACHER STRATEGIES AND STUDENT ENGAGEMENT OBSERVATION INSTRUMENTS

Abbreviations used on Teacher Strategies Instrument

SVC - Stimulus, Variation, and Change
S/N - Changes Activity
KMM - Encourages Manipulation of Materials
TVS - Uses Visual Aids
MOV - Moves
O - Orients
CHO - Choice
SE - States/Explain
SUM - Summarizes
I - Individualizes
PT - Personalizes Task
SQ - Questions
CHL - Challenges
F - Gives Feedback
CT - Constrains by Touching
COM - Fosters Competition
P - Personalizes
S/L - Smiles
PHY - Touches
LIS - Listens
SUC - Anticipates Success
RIA - Recognizes Individual Achievement
AM - Administers/Manages
D - Disciplines

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STANFORD R&D CENTER - PROJECT 3C
TEACHER STRATEGIES OBSERVATION INSTRUMENT
DATE__________

ROUND_____ TIME_____
TEACHER__________
LESSON__________

OBSERVER__________

PAGE__________

	Stimulus/ Variation and Change					Task Structuring						Evaluating					Affective							Admin. Man.		
TIME	SVC	S/N	KMM	TVS	MOV	O	CHO	SE	SUM	I	PT	SO	CHL	F	CT	COM	P	S/L	PHY	LIS	SUC	RIA	AM	D	OTHER
1																									
2																									
3																									
4																									
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Abbreviations used on Student Engagement Instrument

Sex

M - Males
F - Females

Race

W - White
B - Black
M - Mexican-American
A - Asian
O - Other

MOT - Motor

E - Engaged
D - Disengaged

VER - Verbal

VIS - Visual

Global Assessment

R - Receptive
E - Expressive
P - Passive
D - Disruptive

Direction

N - Non-Task
T - Teacher
A - Aide
M - Material
P - Peer

Grouping

2 - Dyadic
S - Small
L - Large

9/72

STANFORD R&D CENTER - PROJECT 3C
STUDENT ENGAGEMENT OBSERVATION INSTRUMENT
DATE ______________

ROUND ________ TIME ____________
TEACHER ______________________
LESSON ______________________

OBSERVER ______________
PAGE ________ OF ________

DESCRIPTIONS	TIME	SEX		RACE					MOT		VER		VIS		GLOBAL ASSESSMENT				DIRECTION					GROUPING			OTHER
		M	F	W	B	M	A	O	E	D	E	D	E	D	K	E	P	D	N	T	A	M	P	2	S	L	
1																											
2																											
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APPENDIX B

TEACHER ATTITUDE INSTRUMENT

PART A: TEACHER QUESTIONNAIRE
PART B: TEACHER CONTROL IDEOLOGY

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TEACHER QUESTIONNAIRE - PART A

1. Which of the following most accurately characterizes the grouping of your homeroom students when they are working in Math? (Choose one only)

_____ a. My homeroom students are grouped with other students on a school-wide basis during math instruction.

_____ b. My homeroom students are grouped with students from my teammate's homeroom(s) during math instruction.

_____ c. The students in my homeroom are divided into groups for math and no students from other homerooms are included in these groups.

_____ d. The students in my homeroom are not grouped during math instruction.

2. Which of the following most accurately characterizes the students you are teaching when you are teaching math? (Choose one only)

_____ a. All students work on the same curriculum materials at the same pace.

_____ b. Students are divided into groups which work at different levels, but the students within each group work on the same materials at the same pace.

_____ c. Students work individually through the same materials, but at differing paces.

_____ d. Students are divided into groups which work at differing levels, but students within each group go at differing paces.

_____ e. Students, individually or in groups, use a variety of materials and progress at their own rates.

_____ f. I do not teach math.

3. On the average, how many hours per week do you spend planning math lessons?

________ hours/week planning by myself.

________ hours/week planning jointly with other teachers.

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4. Which of the following best describes the way you have organized math instruction? (Choose one only)

_____ a. I have sole responsibility for teaching math to a specific group(s) of students.

_____ b. I share with one or more teammates the responsibility of teaching math to a large group of students, but each teacher usually works with a specific sub-group for which she or he has major responsibility.

_____ c. I share with one or more teammates the responsibility of teaching math to a large group of students, and the students with whom each teacher works varies from day to day.

_____ d. I do not teach math.

5. When students are working individually on math lessons (you are not lecturing), which of the following descriptions applies? (Check one only)

_____ a. A student in my classroom usually is allowed to approach and interact with any student in the room.

_____ b. A student in my classroom usually is allowed to interact with students in his/her workgroup.

_____ c. A student in my classroom is usually expected to talk only with students in his immediate vicinity (next to, in front of, etc.).

_____ d. A student in my classroom usually is expected not to talk with another student without asking permission from myself or another adult.

6. When students in your classroom are working individually on math lessons, (you are not lecturing), which of the following most closely describes your rules concerning student movement? (Check one only)

_____ a. A student is expected to ask permission if he/she wishes to leave his/her seat.

_____ b. A student is expected to stay in his/her seat unless going to an an adult for assistance.

_____ c. A student is expected to ask permission if he/she wishes to leave the classroom but is free to move within the classroom.

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_____ d. A student is free to move in the classroom and may leave the classroom (to get a drink, go to washroom) without asking permission from a teacher or aide.

7. How frequently do you use the following methods of making assignments in math?

A. I give the students specific assignments for the period.

____ Almost always ____ Very often ____ Often ____ Sometimes ____ Almost never

B. I give the students a set of assignments to be completed by the end of a definite period and each student chooses the order in which he/she works upon the assignments. (This method is sometimes called "contracts")

____ Almost always ____ Very often ____ Often ____ Sometimes ____ Almost never

C. My students are working on completely individualized materials: each child "chooses" his task according to his/her own rate of progress.

____ Almost always ____ Very often ____ Often ____ Sometimes ____ Almost never

D. I guide the students in developing their own assignments or tasks.

____ Almost always ____ Very often ____ Often ____ Sometimes ____ Almost never

E. When developing assignments I solicit alternatives from my students.

____ Almost always ____ Very often ____ Often ____ Sometimes ____ Almost never

8. When you are teaching math, how many hours per week do your students spend in the following types of work groups? (A rough estimate is sufficient) In answering, please consider only experiences common to most of your students.

_____ hrs/wk working with another teacher or myself in small groups. (6 or fewer pupils)

_____ hrs/wk working with an aide in small groups. (6 or fewer pupils)

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_____ hrs/wk working with materials, supervised by teacher or aide.

_____ hrs/wk in large groups during a lecture from myself or another teacher.

_____ Hrs/wk working with cross-age tutor.

9. How many of your homeroom students receive regular tutoring in math from any of the following sources: yourself, another teacher, an aide, a student tutor?

________ Number of students

10. When students are working on math assignments, how often do you use the following arrangements:

a. I assign each student to a work partner or group.

____ Almost always ____ Very often ____ Often ____ Sometimes ____ Almost never

b. I have students work by themselves.

____ Almost always ____ Very often ____ Often ____ Sometimes ____ Almost never

c. I have students choose work partners or groups.

____ Almost always ____ Very often ____ Often ____ SOmetimes ____ Almost never

d. I have students sit in assigned seats.

____ Almost always ____ Very often ____ Often ____ Sometimes ____ Almost never

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11. Which of the following most accurately characterizes the grouping of your homeroom students when they are working in Language Arts? (Choose one only)

_____ a. My homeroom students are grouped with other students on a school-wide basis during Language Arts instruction.
_____ b. My homeroom students are grouped with students from my teammate's homeroom(s) during Language Arts instruction.
_____ c. The students in my homeroom are divided into groups for Language Arts and no students from other homerooms are included in these groups.
_____ d. The students in my homeroom are not grouped during Language Arts instruction.

12. Which of the following most accurately characterizes the students you are teaching when you are teaching Language Arts? (Choose one only)

_____ a. All students work on the same curriculum materials at the same pace.
_____ b. Students are divided into groups which work at different levels, but the students within each group work on the same materials at the same pace.
_____ c. Students work individually through the same materials, but at differing paces.
_____ d. Students are divided into groups which work at differing levels, but students within each group go at differing paces.
_____ e. Students, individually or in groups, use a variety of materials and progress at their own rates.
_____ f. I do not teach Language Arts.

13. On the average, how many hours per week do you spend planning Language Arts lessons?

_____ hours/week planning by myself.

_____ hours/week planning jointly with other teachers.

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14. Which of the following best describes the way you have organized Language Arts instruction? (Choose one only)

_____ a. I have sole responsibilty for teaching Language Arts to a specific group(s) of students.
_____ b. I share with one or more teammates the responsibility of teaching Language Arts to a large group of students, but each teacher usually works with a specific sub-group for which she or he has major responsibility.
_____ c. I share with one or more teammates the responsibility of teaching Language Arts to a large group of students, and the students with whom each teacher works varies from day to day.
_____ d. I do not teach Language Arts.

15. When students are working individually on Language Arts lessons (you are not lecturing), which of the following descriptions applies? (Check one only)

_____ a. A student in my classroom usually is allowed to approach and interact with any student in the room.
_____ b. A student in my classroom usually is allowed to interact with students in his/her workgroup.
_____ c. A student in my classroom usually is expected to talk only with students in his vicinity (next to, in front of, etc.)
_____ d. A student in my classroom usually is expected not to talk with another student without asking permission from myself or another adult.

16. When students in your classroom are working individually on Language Arts lessons, (you are not lecturing), which of the following most closely describes your rules concerning student movement? (Check one only)

_____ a. A student is expected to ask permission if he/she wishes to leave his/her seat.
_____ b. A student is expected to stay in his/her seat unless going to an adult for assistance.
_____ c. A student is expected to ask permission if he/she wishes to leave the classroom but is free to move within the classroom.
_____ d. A student is free to move in the classroom and may leave the classroom (to get a drink, go to washroom) without asking permission from a teacher or aide.

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17. How frequently do you use the following methods of making assignments in Language Arts?

A. I give the students specific assignments for the period.

____Almost always ____Very often ____Often ____Sometimes ____Almost never

B. I give the students a set of assignments to be completed by the end of a definite period and each student chooses the order in which he/she works upon the assignments. (This method is sometimes called "contracts")

____Almost always ____Very often ____Often ____Sometimes ____Almost never

C. My students are working on completely individualized materials, each child "chooses" his task according to his/her own rate of progress.

____Almost always ____Very often ____ Often ____Sometimes ____Almost never

D. I guide the students in developing their own assignments or tasks.

____Almost always ____Very often ____Often ____Sometimes ____Almost never

E. When developing assignments I solicit alternatives from my students.

____Almost always ____Very often ____Often ____Sometimes ____ Almost never

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18. When you are teaching Language Arts, how many hours per week do your students spend in the following types of work groups? (A rough estimate is sufficient) In answering, please consider only experiences common to most of your students.

____hrs/wk working with another teacher or myself in small groups. (6 or fewer pupils)
____hrs/wk working with an aide in small groups. (6 or fewer pupils)
____hrs/wk working with materials, supervised by teacher or aide.
____hrs/wk in large groups during a lecture from myself or another teacher.
____hrs/wk working with cross-age tutor.

19. How many of your homeroom students receive regular tutoring in Language Arts from any of the following sources: yourself, another teacher, an aide, a student tutor?

____Number of students

20. When students are working on Language Arts assignments, how often do you use the following arrangements:

a. I assign each student to a work partner or group.

____Almost always ____Very often ____Often ____Sometimes ____Almost never

b. I have students work by themselves.

____Almost always ____Very often ____Often ____Sometimes ____Almost never

c. I have students choose work partners or groups.

____Almost always ____Very often ____Often ____Sometimes ____Almost never

d. I have students sit in assigned seats.

____Always always ____Very often ____Often ____Sometimes ____Almost never

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21. When a student completes an assignment, which of these alternatives is open to him/her? (Check all that apply)

_____ a. Read a library book.
_____ b. Go to a learning center.
_____ c. Go to game or activity corner (games, phonograph)
_____ d. Work on other assignment.
_____ e. Help another student with his work.
_____ f. Go to library or media center.
_____ g. Other (please specify) ______________________________

____

____

22. Is there a regular time during the day or week when students choose their activity? (Check all that apply)

_____ a. no.
_____ b. After completing an assignment.
_____ c. A set time each day. (Please estimate number of hours.)
_____ d. A set time (s) during the week. (Please estimate # of Hours)

23. Suppose you had to move to a new school district.

A. What type of school building would you prefer? (Please show your preference by putting a "1" by your first choice, "2" by your second choice, "3" by your third choice.)

_____ "permanent portables".
_____ "a building with self-contained classrooms.
_____ a "semi-open" building with walls between grade levels.
_____ an open building with no walls.

B. Would you like to continue teaching? (Imagine the job market to be open and the demand for teachers is high). Check any that apply

_____ Yes, I would like to continue teaching at a school like this.
_____ Yes, I would like to continue teaching but I would like to teach in a different economic or ethnic community.
_____ Yes, I would continue teaching but I would prefer a different level (preschool, junior high, highschool).
_____ Yes, but I would like to become a specialist (media, EMR, resource, reading etc.)

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____ No, I would become an administrator.
____ No, I would obtain a job in education but outside the school, such as becoming an educational consultant or working with a curriculum development company.
____ No, I would obtain a job which would not necessarily be related to education.
____ No, I would retire, at least for a few years.

24. How many years can a competent teacher teach in your school without loosing effectiveness?

____ less than 1 year
____ 1-3 years
____ 4-6 years
____ 7-9 years
____ 10-12 years
____ 13-15 years
____ 16-more years

25. How often do you talk informally, aside from prearranged or formal group meetings with other teachers about...

	1 at least once a day	2 at least once a week	3 at least once a month	4 less than once a month	5 never
a. Curriculum planning	____	____	____	____	____
b. Teaching specific lessons, classes, or pupils	____	____	____	____	____
c. Student discipline and control	____	____	____	____	____

26. How often do you and your teammates discuss these subjects in prearranged meetings?

	1 at least once a day	2 at least once a week	3 at least once a month	4 less than once a month	5 never
a. Curriculum planning	____	____	____	____	____

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	1 at least once a day	2 at least once a week	3 at least once a month	4 less than once a month	5 never
b. Teaching specific lessons, classes, or pupils	____	____	____	____	____
c. Student discipline and control	____	____	____	____	____

27. When you meet with school committees, or other teacher groups (but not team meetings), how often do you discuss...

	1 at least once a day	2 at least once a week	3 at least once a month	4 less than once a month	5 never
a. Curriculum planning	____	____	____	____	____
b. Teaching specific lessons, classes or pupils	____	____	____	____	____
c. Student discipline and control	____	____	____	____	____

28. How often do you talk individually with the principal about...

	1 at least once a day	2 at least once a week	3 at least once a month	4 less than once a month	5 never
a. Curriculum planning	____	____	____	____	____
b. Teaching specific lessons, classes, or pupils	____	____	____	____	____
c. Student discipline and control	____	____	____	____	____

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29. How often do you receive feedback and/or advice from your teammates about your own...

	1 at least once a day	2 at least once a week	3 at least once a month	4 less than once a month	5 never
a. Curriculum planning	___	___	___	___	___
b. Teaching specific lessons, classes or pupils	___	___	___	___	___
c. Student discipline and control practices	___	___	___	___	___

30. How often do you receive feedback and/or advice from the principal about your own...

	1 at least once a day	2 at least once a week	3 at least once a month	4 less than once a month	5 never
a. Curriculum planning	___	___	___	___	___
b. Teaching specific lessons, classes or pupils	___	___	___	___	___
c. Student discipline and control practices	___	___	___	___	___

31. How much influence fo you have over your own...

	1 a great deal	2 a considerable amount	3 a moderate amount	4 not very much	5 none
a. Curriculum planning	___	___	___	___	___
b. Teaching specific lessons, classes, or pupils	___	___	___	___	___
c. Student control and discipline practices	___	___	___	___	___

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32. How much influence do school committees, or teacher groups (e.g., similar grade level subject area) have over your own...

	1 a great deal	2 a considerable amount	3 a moderate amount	4 not very much	5 none
a. Administration of school rules and regulations	____	____	____	____	____
b. Student grading practices	____	____	____	____	____
c. Curriculum planning	____	____	____	____	____
d. Teaching specific lessons, classes or pupils	____	____	____	____	____
e. Student control and discipline practices	____	____	____	____	____

33. How much influence do your teammates have over your own...

	1 a great deal	2 a considerable amount	3 a moderate amount	4 not very much	5 none
a. Curriculum planning	____	____	____	____	____
b. Teaching specific lessons, classes, or pupils	____	____	____	____	____
c. Student control and discipline practices	____	____	____	____	____

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34. How much influence does the principal have over your own...

	1 a great deal	2 a considerable amount	3 a moderate amount	4 not very much	5 none
a. Curriculum planning	_____	_____	_____	_____	_____
b. Teaching specific lessons, classes, or pupils	_____	_____	_____	_____	_____
c. Student control and discipline practices	_____	_____	_____	_____	_____

35. Listed below are factors which are often identified by teachers as influencing a student's behavior in the classroom.

a. On the average, how would you rate the relative importance of these factors in determining a pupil's attention to approved classroom activities in your classroom?

Divide 100% among the factors according to their importance·

____ physical environment and materials provided in the school

____ a student's attitudes and innate characteristics

____ your efforts as a teacher

____ the efforts of your teammate(s)

b. On the average, how would you rate the relative importance of these factors in determining a pupil's achievement in your classroom?

Divide 100% among the factors according to their importance:

_____physical environment and materials provided in the school

____ a student's attitudes and innate characteristics

____ your efforts as a teacher

____ the efforts of your teammate(s)

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36. Do you use a specific teaching method in your classroom? Check any methods which apply in each of the following:

IN YOUR MATH CLASS	IN YOUR LANGUAGE ARTS CLASS (or Kindergarten or Reading Readiness)
_____ DISTAR (Bereiter-Englemann)	_____ DISTAR (Bereiter-Englemann)
_____ Glaser Method	_____ Glaser Method
_____ Behavioral Modification Techniques	_____ Behavioral Modification Techniques
_____ Other (Specify)	_____ Other (Specify)
______________________________	______________________________
______________________________	______________________________

TEACHER QUESTIONNAIRE - PART B

The following statements are about children in general. Even though children do differ from each other, please answer these questions with the "typical" child in your class in mind.

The answering categories are: SA=strongly agree; A=agree; U=undecided; D=disagree; SD=strongly disagree.

Please respond to each statement by placing an "x" in the category which best describes how you feel about these statements.

	SA	A	U	D	SD
1. In general, school children should be allowed a lot of freedom as they carry out learning activities.					
2. A child should obtain the consent of the teacher before moving about in the classroom.					
3. Children are not mature enough to make their own decisions about their learning activities.					
4. Children get distracted when other activities are going on around them.					
5. Most children are capable of being resourceful when left on their own.					
6. Children are unlikely to learn enough if they are frequently moving about.					
7. Children should normally be encouraged to get information from each other instead of asking the teacher.					
8. Children can learn from small group discussion without the help of an adult.					
9. It is good for the child to have his activities scheduled for him.					

APPENDIX C

DATA ON TEACHERS' USE OF DIFFERENT SIZED INSTRUCTIONAL GROUPS, CLASSROOM ORGANIZATION, AND SPECIFIC STRATEGIES

This appendix contains information on the frequency with which teachers used different instructional strategies in their classes and/or the relationship between such usage and other variables--architectural condition, grade level, ethnicity, and sex.

TABLE C.1

Teachers' Use of Group Sizes by Grade Level and Architectural Condition (Percentage of Observation Intervals)

Grade Level	Self-Contained			Open Space		
	Dyadic	Small	Large	Dyadic	Small	Large
K-1	34.3	20.1	45.6	52.3	25.3	20.4
2-3	34.3	17.5	48.1	50.5	13.6	36.0
4-6	39.5	7.5	53.0	54.6	15.3	30.1
Mean	35.4	15.9	48.7	52.1	18.5	29.4
Range	11.1-50.9	0-54.9	27.3-72.0	40.5-68.5	.2-57.2	0-53.2

Note: N=5 teachers for each grade level.

TABLE C.2

Percentage of Student Observation Intervals by Group Size, by Sex, by Direction of Attention, and by Architectural Condition

	Self-Contained						Open Space					
	Teacher-Directed			Material/Peer-Directed			Teacher-Directed			Material/Peer-Directed		
Sex	Dyadic	Small	Large	Dyadic	Small	Large	Dyadic	Small	Large	Dyadic	Small	Large
Female	24.5	11.6	63.9	2.3	15.1	82.2	36.8	15.7	47.5	4.9	28.4	44.7
Male	28.0	13.0	59.0	2.3	11.9	85.9	41.8	18.4	39.8	4.5	24.6	70.9

TABLE C.3

Percentage of Student Observation Intervals by Group Size, by Ethnicity, by Direction of Attention, and by Architectural Condition

	Self-Contained						Open Space					
	Teacher-Directed			Material/Peer-Directed			Teacher-Directed			Material/Peer-Directed		
Ethnicity	Dyadic	Small	Large	Dyadic	Small	Large	Dyadic	Small	Large	Dyadic	Small	Large
Anglo	26.8	12.1	61.0	3.0	12.3	84.7	38.6	15.2	46.2	4.8	20.9	74.3
Mexican-American	26.2	12.7	61.1	2.8	14.3	82.9	40.0	18.3	41.8	4.6	31.6	63.8

TABLE C.4

Percentage of Observation Intervals by Direction of Student Attention, by Group Size, and by Architectural Condition

	Self-Contained		Open Space	
Group Size	Teacher-Directed	Material/Peer-Directed	Teacher-Directed	Material/Peer-Directed
Dyadic	26.4	2.9	39.4	4.8
Small	12.5	13.5	17.1	26.4
Large	61.2	83.7	43.5	68.8

TABLE C.5

Teachers' Use of Direction of Student Attention by Grade Level and Architectural Condition (Percentage of Student Observation Intervals)

	Self-Contained		Open Space	
Grade Level	Teacher-Directed	Material/Peer-Directed	Teacher-Directed	Material/Peer-Directed
K-1	73.3	26.6	63.1	36.9
2-3	59.4	40.6	64.2	35.8
4-6	58.9	41.1	44.7	55.3
Mean	63.9	36.1	57.3	42.7
Range	45.5-78.8	21.2-54.5	30.5-83.8	16.2-69.5

Note: N=5 teachers for each grade level.

TABLE C.6

Percentage of Observation Intervals by Direction of Student Attention, by Ethnicity, and by Architectural Condition

Anglo	Self-Contained		Open Space	
Ethnicity	Teacher-Directed	Material/Peer-Directed	Teacher-Directed	Material/Peer-Directed
Anglo	61.9	38.1	53.9	46.1
Mexican-American	63.4	36.6	59.5	40.5

TABLE C.7

Teachers' Strategy Use by Size of Instructional Group and by Architectural Condition (Percentage of Observation Intervals)

	Self-Contained				Open Space			
Strategy	Dyadic	Small	Large	Total	Dyadic	Small	Large	Total
Chg.Act.	1.5	3.3	4.2	3.1	2.0	4.8	4.6	3.3
Surp.	1.1	1.3	1.7	1.4	.3	.1	1.1	.5
E.Man.M.	18.6	17.0	16.3	17.2	15.8	14.4	13.6	14.9
U.Vis.A.	27.1	48.4	44.4	38.9	38.1	55.9	47.2	44.1
Moves	36.5	12.6	34.4	31.7	25.9	14.1	23.0	22.9
Orients	1.4	3.4	4.1	3.0	3.8	6.9	9.0	5.9
Choice	.1	.1	.2	.1	.3	.4	.2	.3
Sts./Exp.	53.8	45.0	43.9	40.5	39.6	48.2	53.5	45.3
Sums.	9.6	11.3	9.7	9.9	16.1	13.9	14.3	15.2
Comds.	27.2	30.4	27.9	28.1	30.1	32.1	28.4	30.0
P.Tsk.	3.4	4.2	4.5	4.0	4.0	4.2	3.3	3.8
Quest.	38.9	42.2	35.4	37.7	42.2	36.3	29.6	37.4
Chall.	3.4	3.6	4.1	3.8	4.3	4.6	3.2	4.1
G.Fdbk.	21.7	19.3	15.6	18.3	23.4	17.0	12.6	19.0
Tests	.4	.1	.9	.6	.9	1.1	3.5	1.7
F.Comp.	1.5	3.3	2.5	2.3	3.0	2.4	2.4	2.7
Pers.	88.4	59.3	57.4	68.7	89.5	65.6	52.1	74.1
Smiles	8.8	9.3	8.7	8.8	7.5	7.0	7.4	7.4
Touches	6.3	3.8	3.2	4.4	3.0	1.1	1.2	2.1
Listens	59.1	50.6	39.7	48.3	73.6	62.5	44.2	62.9
A.Suc.	.9	.8	.7	.8	.4	.4	.7	.5
R.I.A.	7.3	5.5	6.4	6.6	7.0	5.0	5.3	6.1
Adm./Man.	2.8	2.1	3.3	2.9	3.2	2.1	2.4	2.6
Displ.	5.8	3.4	5.0	5.1	3.8	2.8	3.3	3.5
Percent of Total Intervals	35.4	15.9	48.7	100.0	52.1	18.5	29.4	100.0

Note: Number of observation instances in self-contained = 8898. Number of observation instances in open space = 8747.

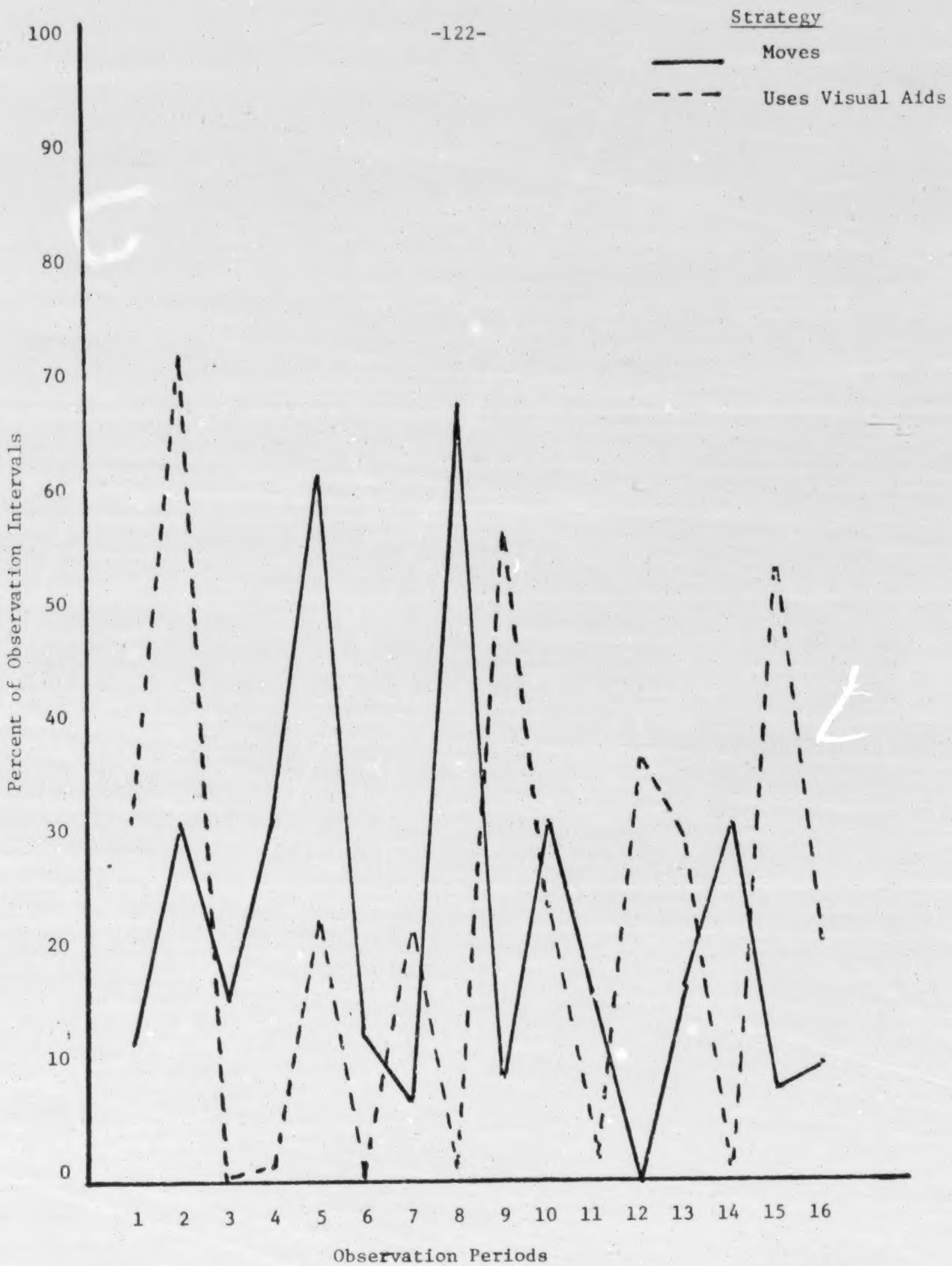

Fig. C.1. Selected strategy use for teacher 11, all subjects, all conditions, all directions.

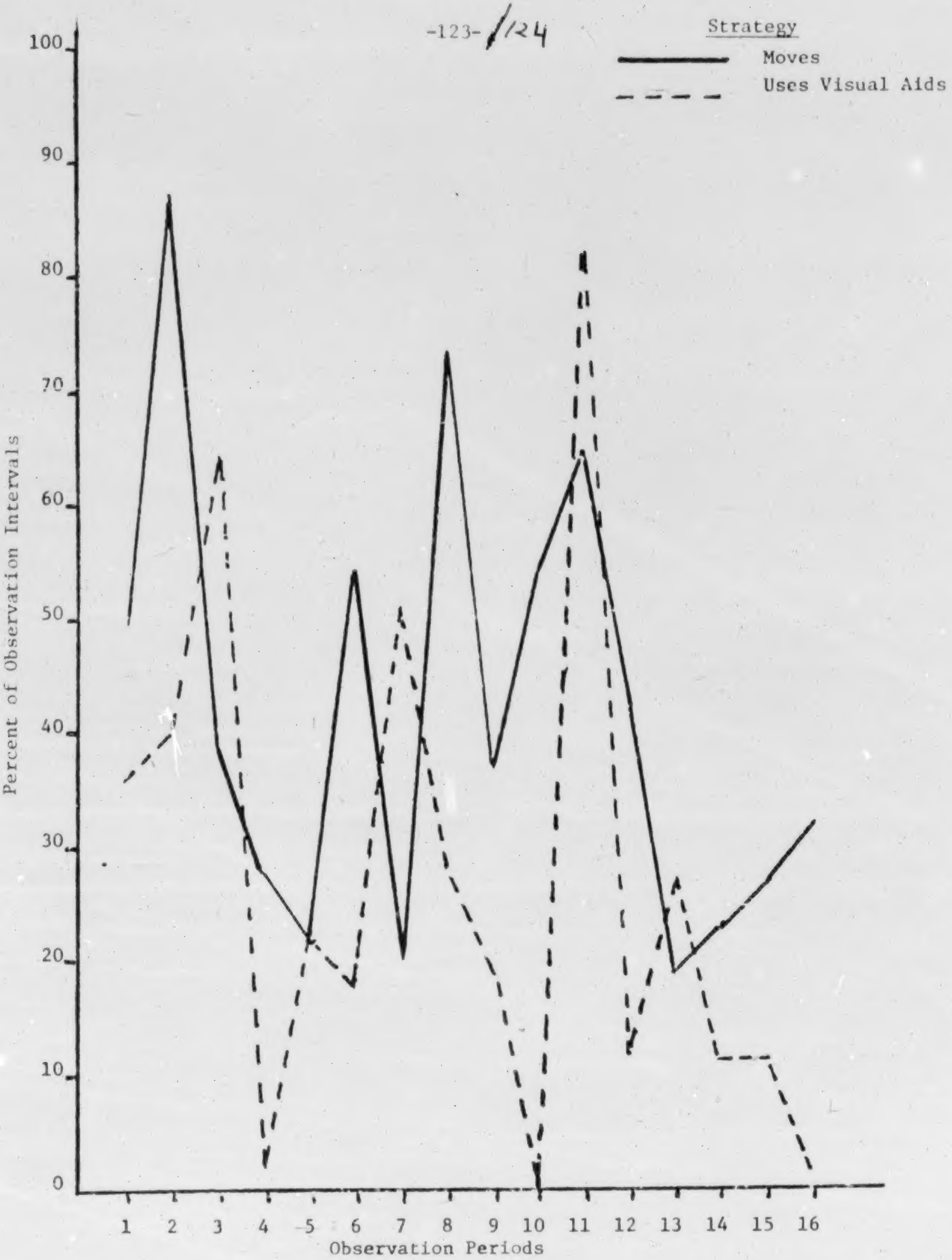

Fig. C.2. Selected strategy use for Teacher 9, all subjects, all conditions, all directions.

APPENDIX D

CREATING COLLABORATIVE RELATIONSHIPS BETWEEN SCHOOL STAFFS AND EDUCATIONAL RESEARCHERS

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APPENDIX D: CREATING COLLABORATIVE RELATIONSHIPS BETWEEN SCHOOL STAFFS AND EDUCATIONAL RESEARCHERS

During the project we attempted to establish structures and procedures for collaborative relationships between school staffs and project researchers. We believed these relationships to be essential to the conduct of intensive classroom observational research endeavors. Furthermore, the establishment of collaborative relationships might be considered an integral aspect of the research process itself. The basic premise of such an approach is that educational research should be conducted through joint participation by researchers and practitioners in order to produce findings that are both theoretically and practically relevant to the improvement of education.

The strategy for collaborative relationships evolved during a period of two years. In recruiting teachers and schools to participate in the study, a standard procedure was used to provide information about the project and its goals and to give opportunity to principals and teachers to ask questions about the sort of commitments that would be involved. Each teacher who agreed to join the study was sent a memo stating what we expected in the way of time and scheduling and presenting our promise to provide feedback about the results of the study. We regarded these memos as informal contracts between our research staff and the teachers involved. During the first year of the project (1971-72), a teacher feedback workshop was conducted at the end of the school year. In the second year (1972-73), while the research project was located in one elementary school, a Joint School-Research Committee was established at the beginning of the school year to discuss research plans and their implementation. The committee was created to facilitate the collaborative process on an ongoing basis and thus increase the exchange of ideas between the school staff and the researchers. A teacher feedback workshop similar to the first one was conducted in September following the second year of research.

The Teacher Feedback Workshop

When teachers were recruited for the study during the first year, we contracted with them to provide a workshop at the end of the school year. The day-long workshop was planned as a development component of the research project and was held at Stanford on May 6, 1972. Of the 24 sample teachers, 21 participated.

Three Principles Underlying the Workshop

We used the following principles to specify conditions for providing feedback to individual teachers based on data collected in their classrooms.

Principle I: Communication of research results to teachers challenges the individual teacher's feelings of competence. Researchers have not dealt seriously with the complex problems of communicating their results to teachers who participate in their projects. Educational research findings, especially those that relate to teaching, have implications for the individual teacher's self-esteem and behavior change. Hence, communication of results is not merely a dissemination problem, it also involves human relations.

The typical method of communication is one-way, through the printed word, lectures, and films. There are two limitations to this approach. First, teachers typically do not read research literature (Lazarsfeld and Sieber, 1964). Second, teachers have not typically been trained with sufficient technical competence to evaluate findings and their potential practical applications.

Many research findings may be packaged, field-tested, and disseminated with accompanying explanatory literature. Findings that affect individual teacher's beliefs, esteems, and attachment to specific teaching techniques, however, can be difficult to accept. Thus, there is a special need for sensitive and creative people to communicate research findings in ways that will produce positive consequences for teachers and their students.

Principle II: Direct teacher participation is essential for planning and carrying out changes in their own teaching. Theory and research

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from group dynamics provide a rich base for developing strategies to involve teachers in planning their own changes in teaching. Research on participation in decision-making indicates that persons are more committed to and more likely to carry out decisions in which they have been involved (Cartwright, 1968; Lewin, 1947).

The rationale for participation in the research process has been described by Mann and Likert (1952). They suggest that personal involvement decreases the barriers to using the data, while it increases the probability that results will be understood and accepted. Involvement also brings about the motivation to apply the results to the individual's own situation. There is some evidence that teachers tend to accept and to regard as valuable those in-service programs that are planned with their involvement (Childress, 1969; Dutton and Hammond, 1966).

This principle operates most clearly in the concept of the British "teacher center" (Bailey, 1971). These centers are based on the tenet that fundamental educational reform will come only through those who have the basic educational responsibility--the teachers. Furthermore, teachers will take change seriously only when they are responsible for defining their own educational problems and receive help on their own terms.

Principle III: Attention to individual differences in research on teaching increases the probability that results will have practical value. Teachers have repeatedly pointed to their personal style of teaching or "bag of tricks" as an explanation for success in the classroom (McCauley, 1972; Marram, 1971), and researchers have outlined reasons for the great variability among teachers in instructional activities (Bedwell, 1965; Lortie, 1969). The body of knowledge and skills that is transmitted in teacher-training programs is not well defined. Once teachers enter the classroom, with the possible exception of the open-plan school or teaming, they rarely observe their peers at work (Meyer et al., 1972).

Researchers on teaching, however, have tended to ignore individual variations in teacher behavior. In his review of teacher variability within and between special curriculum programs, Rosenshine (1970) notes that there are few studies dealing with this problem. Furthermore, the generalizability of the results is limited by the small number of teachers involved in the studies and the disparity of the observational systems used.

The line of analysis of individual differences suggested by Sidman (1960) has promise for linking research and practical applications. Sidman postulates that subject variability is derived from differences in the functional relations between a behavior and its controlling conditions for each person. Thus, the shape of a curve based on group data may indicate that a specific behavior increases as some independent variable increases. Examination of the individual data, however, indicates that each subject reacts maximally at different values of the independent variable. In cases like this, application of group results to individuals may be erroneous. Furthermore, when we are suggesting changes in individual behavior, group results can be simply misleading.

In communicating with teachers about their own behavior and its effect on students, the individual data analysis suggested by Sidman (1960) has potentially useful consequences. Teachers can use their results as a basis for understanding what they are doing and for planning for changes in their behavior. They can make these decisions on relationships found for their own behavior, not on generalized relationships which may not apply to them.

Format of the Workshops

The two teacher feedback workshops were similar in format. There were morning and afternoon sessions, the first of which covered the aims and procedures of the project. Detailed descriptions of the observation instruments were also presented. A report of findings based on analysis of group data was presented to provide a context for understanding the individual data analysis, which was given to teachers in the afternoon sessions. Results were presented in nontechnical language with a heavy reliance on graphics to illustrate specific points.

In the afternoon sessions, all teachers received individualized feedback from trained feedbackers. Procedures had been developed by the project staff to utilize videotapes as a means for discussing individual data analysis based on classroom observations. Questions covered for group data in the morning session were applied to the individual teacher data: What strategies do you use most often? What strategies do you use least? Which specific strategies appear to have the most impact on student engagement in your class?

There is some evidence from teachers' responses to a questionnaire at the first workshop that the findings presented had positive consequences for their teaching behavior. Of the 17 teachers who answered the questionnaire, 16 reported they had learned something new about their teaching, 12 thought that they should change some of the ways they teach, and 16 said results and discussions in the workshop could really help teachers to change their behavior. Sixteen of the teachers thought that the results would be useful to classroom teachers in general, and all replied that they believed educational research can produce knowledge useful to teachers.

The teacher feedback workshop, then, served to involve the sample teachers and research staff in an exchange process in which teachers received feedback about their classrooms while the researchers gained feedback on their findings. Teachers became engaged in the process of providing alternative interpretations related to some puzzling results. The first workshop was productive enough to stimulate the creation of a means to "institutionalize" the exchange into a group which would meet regularly during the research project in its second year. This group came to be known as the Joint School-Research Committee.

Joint School-Research Committee

When the staff of the elementary school was approached for their participation in our second-year study, a means of involving the teachers in the research process was proposed. A group of representatives from the research and school staffs would meet regularly for two purposes: to review research procedures, including the examination and clearance of observation instruments, questionnaires, interview schedules, and other data-gathering devices; and to discuss potential areas for research which reflected teachers' interests and concerns. The two purposes were intended to provide mutually beneficial outcomes for both parties. Some teachers would become acquainted with the problems of carrying out research, while the discussions could potentially direct the researchers to problems in the school setting.

The Joint School-Research Committee met monthly during the school year. Staff representatives from the school included the principal, teacher representatives from grade levels K-3 and 4-6, and a representative from the nonclassroom specialists. The teachers were selected by the principal as part of their assignments to school committees. The research staff was represented by one of the project investigators, a research assistant, and a representative from the observer team. The committee agendas indicated that the first purpose set forth above was the primary subject of each of the monthly meetings. Plans for various research procedures were presented by the research staff. The school group made recommendations about scheduling, the administration of questionnaires and interviews, and gave feedback on the construction of the Student Engagement Instrument. The meetings lasted an hour but this was not adequate time for the full discussion of research issues and questions which concerned the school staff. Furthermore, the teachers were involved in many tasks related to changing from self-contained to open-space classrooms. Hence, the committee served mainly as an administrative and facilitative group in the implementation of the research plans.

In retrospect, however, the committee was essential to the successful completion of the study. The change in school setting from self-contained to open-space classrooms was one in which changes in behavior and attitudes were required of teachers and students. Simultaneously, teams of our project observers and other visitors were present almost continuously during the classroom observation periods. Given the presence of a highly competent observer team and the existence of the committee, many potentially troublesome situations were averted.

The two aspects of our relationships with school staffs--the teacher feedback workshop and the Joint School-Research Committee--were vital to the successful completion and quality of our research effort. One of the more significant results of this facet of our study has been the experience of school and research staffs that it is possible to undertake joint, cooperative studies in the area of educational research.